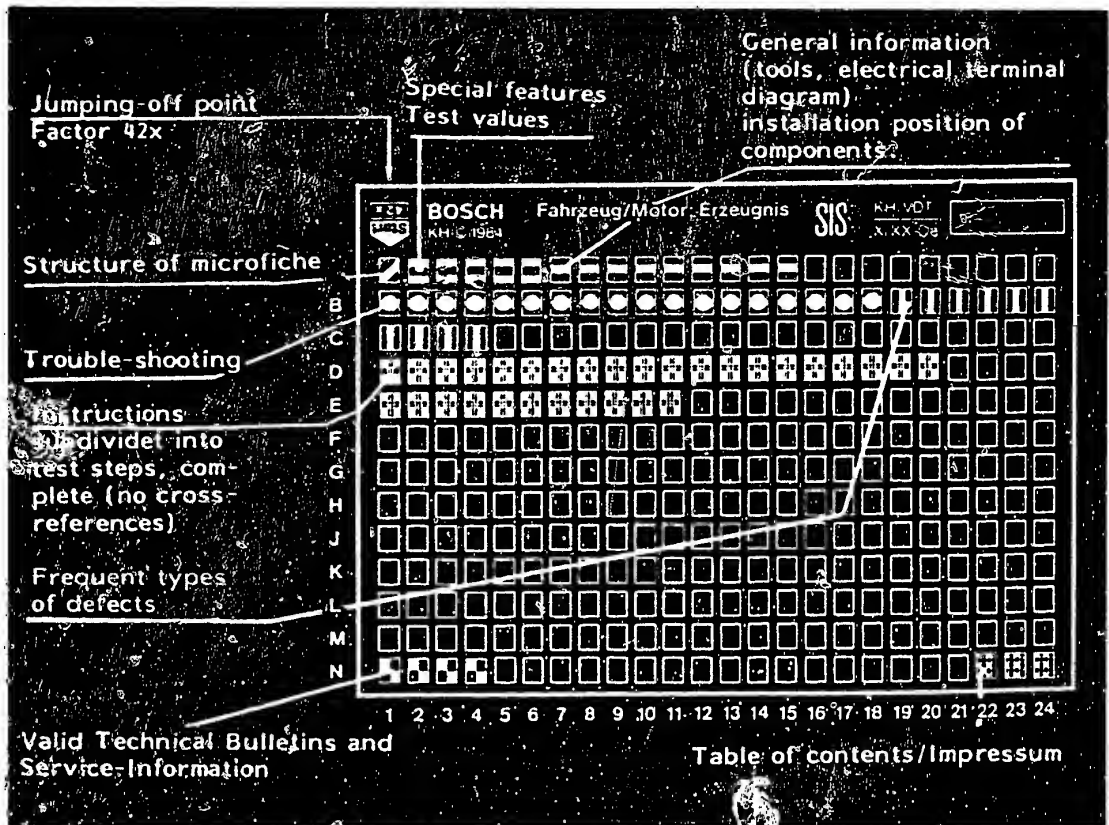


## Structure of microfiche

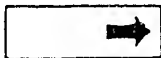


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

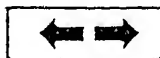
|            |                             |
|------------|-----------------------------|
| <b>E16</b> | Product/component/test step |
|            | Vehicle/engine              |

Coordinate

3. Limits of section



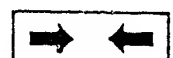
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C6**

**A1**

Trouble-shooting program



## 1. Special features

Alternators 0 120 340 .. are externally mounted. The stator, with the brush holder plate, and the rotor are seated on the crankshaft or on the engine housing. The rectifier plate is fastened to the vehicle outside the alternator.

These alternators are installed in motorcycles.

## 2. Test specifications

### 2.1 Electrical test specifications

2.1.1 Suppression capacitor 1.8 ... 2.6  $\mu\text{F}$

### 2.1.2 Resistance values

| Alternators 0 120 340 ..     | Stator <sup>2)</sup><br>$\Omega + 10\%$ | Rotor<br>$\Omega + 10\%$ |
|------------------------------|---|--------------------------|
| 005,<br>G1 (RL) 14V 18A22    | 0.76                                    | 3.4                      |
| 006,<br>G1 (RL) 14V 20A18    | 0.76 (0.62) <sup>3)</sup>               | 2.8                      |
| 002/004<br>G1 (RL) 14V 20A21 | 0.76                                    | 3.4                      |

2) between phase outlets (U-V-W)

3) With stator 1 125 043 013

### 2.1.3 Current consumption of the rotor winding

Specified value 2.5 ... 4.5 A

**A2**

Test specifications

Motorcycle alternators 0 120 340 ..



#### 2.1.4 Regulated voltage

**B15**

Regulator (EF) 0 192 062 002

Regulated voltage                      13.7 ... 14.5 V  
at load                                     $\leq 10$  A

#### 2.1.5 Power test

(warm alternator (+60°C) with regulator  
Hold regulated voltage at 13 V by loading.

**B17**

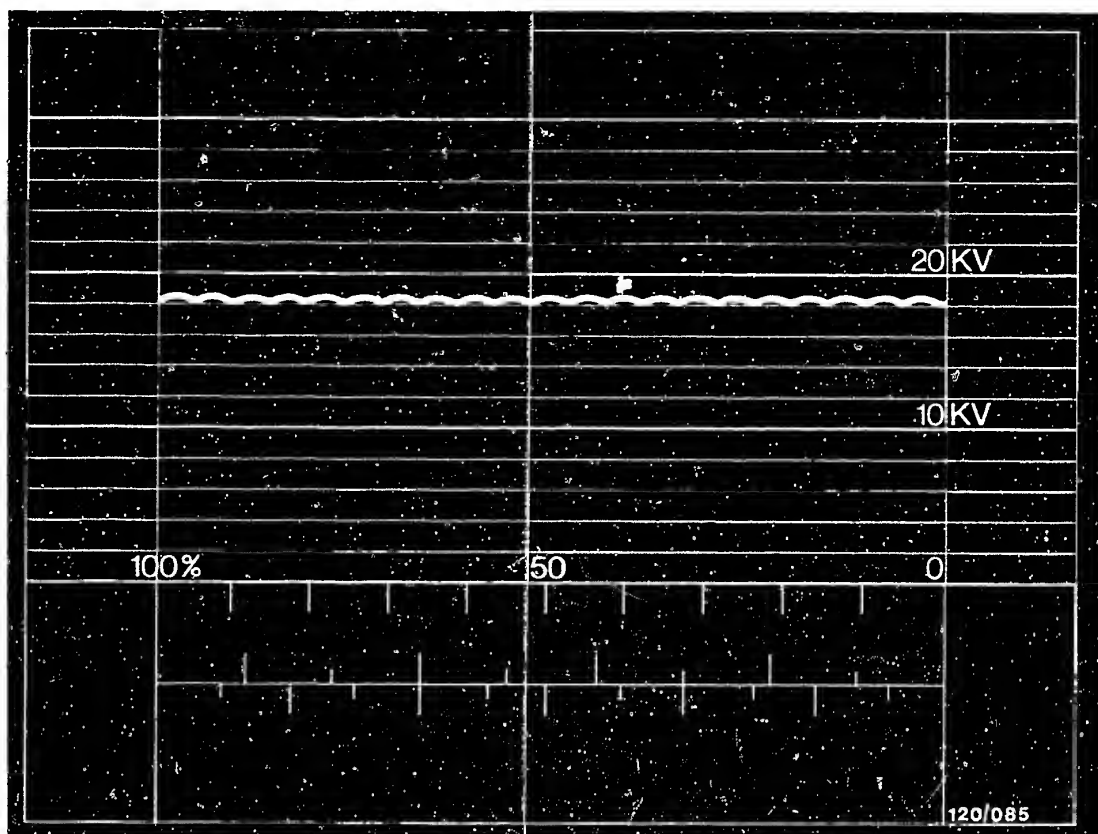
| Alternators<br>0 120 340 .. | Rotational<br>speed<br>min <sup>-1</sup> | Load current<br>A |
|-----------------------------|--|-------------------|
| 005<br>G1(RL) 14V 18A22     | 1350<br>2200<br>5000                     | 5<br>12<br>18     |
| 006<br>G1(RL) 14V 20A18     | 1050<br>1800<br>7000                     | 5<br>13<br>19     |
| 002/004<br>G1(RL) 14V 20A21 | 1300<br>2100<br>7000                     | 5<br>13<br>20     |

**A3**

Test specifications

Motorcycle alternators 0 120 340 ..





### "Good" oscillogram

If the alternator is in proper condition, this pattern is obtained. The DC voltage has a slight ripple. The oscillogram shown can have small peaks if the alternator regulator is working. The regulator can be "set still" by adding load (e.g., loading resistor).

Adjust the height of the pattern in such a way that the ripple lies between 2 adjacent kV lines.

In order to make it possible to compare such patterns, adjust the pattern in question using the vertical control of the oscilloscope so that it fits in approximately between the 10 and 20 kV lines.

Note: Several defects can occur simultaneously.



## 2.1.2 Mechanical test specifications

### 2.2.1 Deviations in runout

Outside diameter of the rotor 0.05 mm  
Outside diameter of the collector rings 0.03 mm

**D11**

One-sided air gap  $\geq 0.20$  mm

Minimum diameter of the collector rings

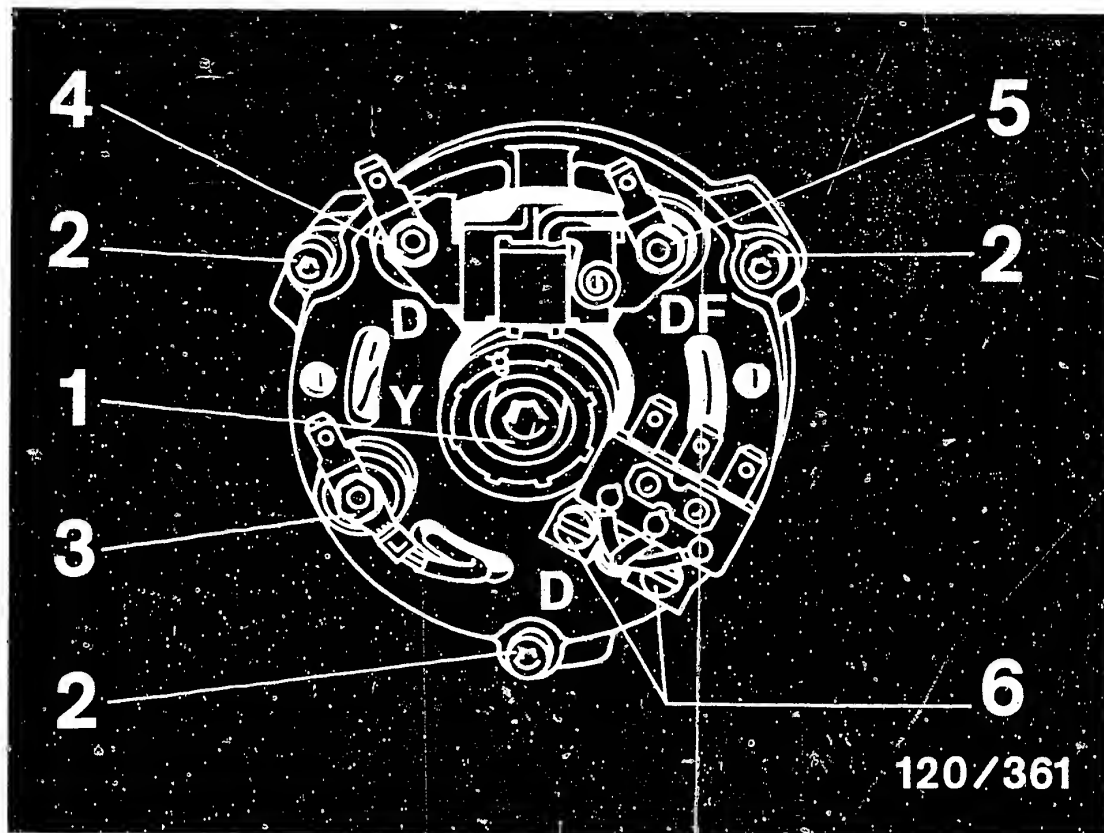
Alternators 0 120 340 .. new 32.5 mm  
min. dia. 31.5 mm

### 2.2.2 Minimum projection of the carbon brushes

**D15**

Alternators 0 120 340 .. new 10.0 mm  
min. 5.0 mm



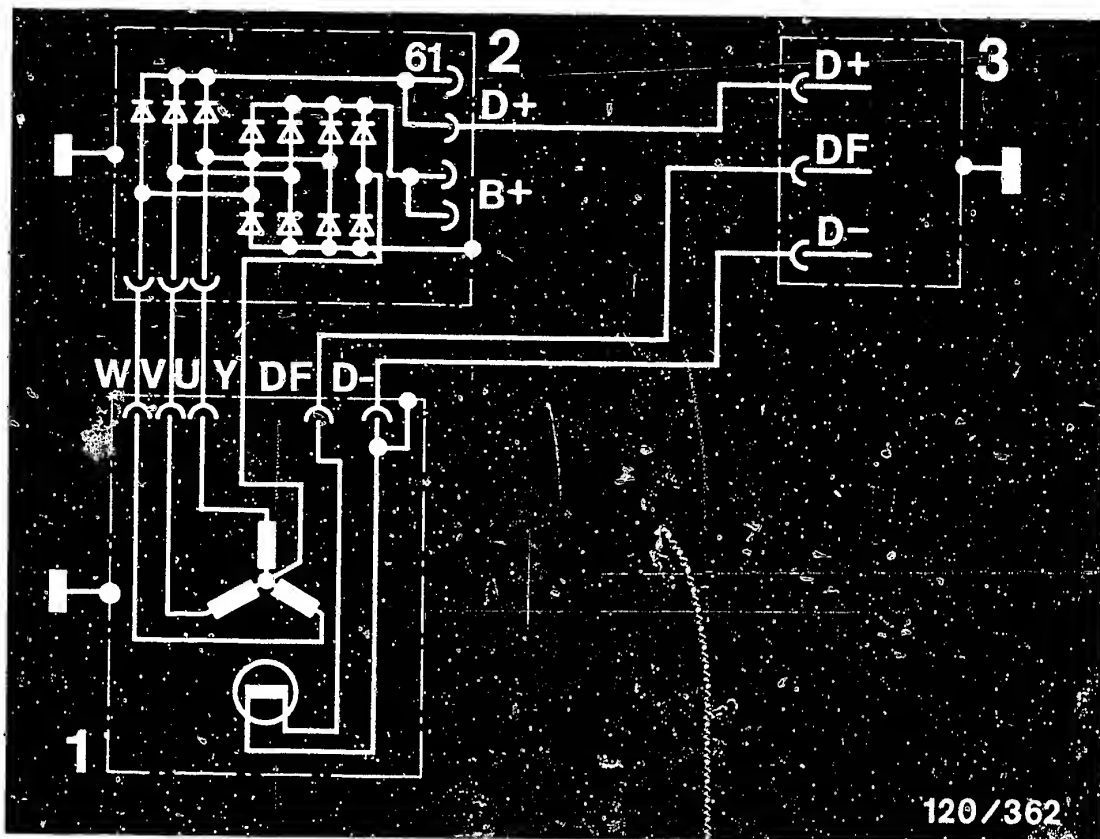


120/361

### 2.2.3 Tightening torques on alternators 0 120 340 ..

|                               |     |     |     |    |
|-------------------------------|-----|-----|-----|----|
| Item 1, socket hex screw (1)  | 20  | ... | 24  | Nm |
| Item 2, socket hex screws (3) | 2.7 | ... | 3.8 | Nm |
| Item 3, hex nut               | 2.7 | ... | 3.8 | Nm |
| Item 4, hex nut               | 2.7 | ... | 3.8 | Nm |
| Item 5, hex nut               | 2.7 | ... | 3.8 | Nm |
| Item 6, flat-head screws (2)  | 2.7 | ... | 3.8 | Nm |





- 1 = Alternator
- 2 = Rectifier
- 3 = Regulator

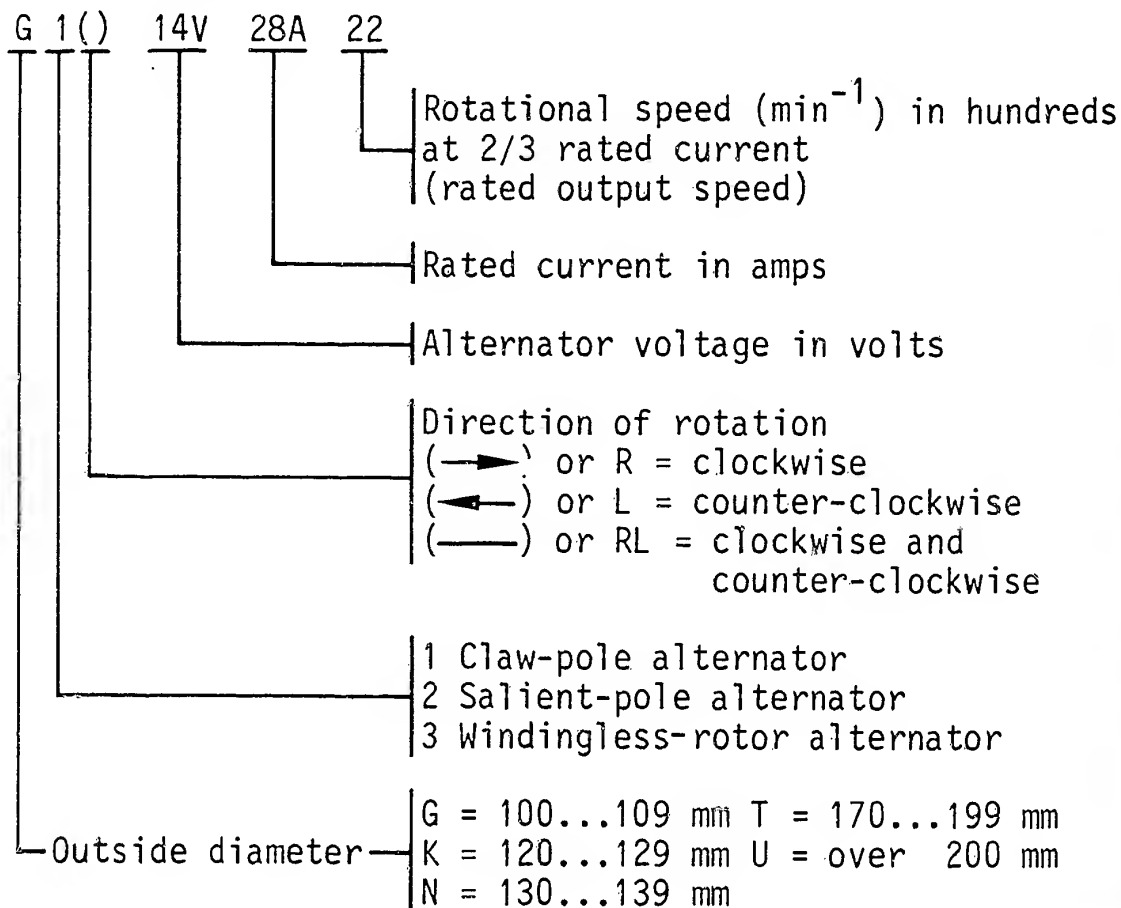
### 3. Wiring diagram for alternators

0 120 340 002 ... 0 120 340 006  
(G1 (RL) 14V..A..)



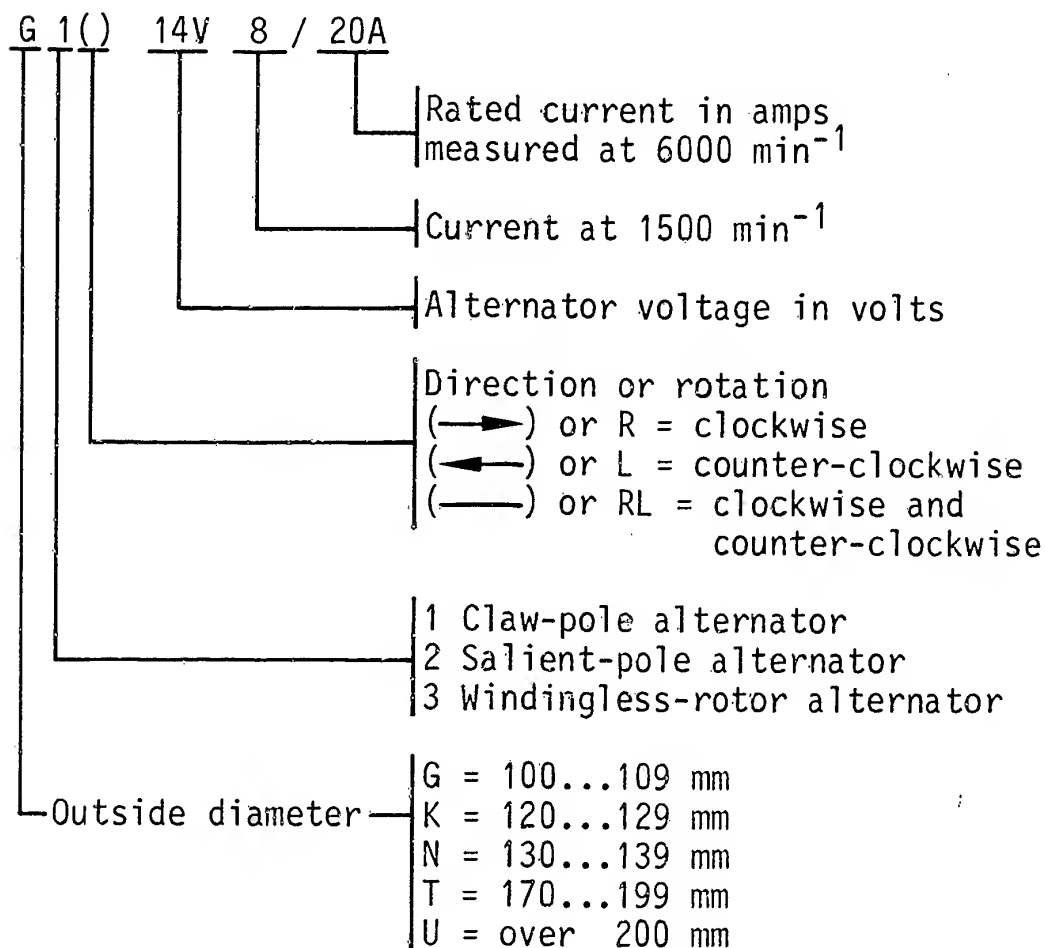
#### 4. General instructions

##### 4.1 Explanation of the type code on the alternator (old)





## 4.2 Explanation of the type code on the alternator (new as of the start of 1983)



### 4.3 Cleaning parts

CAUTION! FIRE HAZARD!

Alternators are being increasingly fitted with capacitors having a long storage life (e.g., for interference suppression of receivers and transmitters).

When alternator parts (rectifiers) are being washed out, it can happen the capacitor will discharge when immersed in the cleaning fluids. That can ignite highly flammable liquids. For that reason, wash out parts with capacitors only in try- or perchlorethylene.

#### Note:

These repair instructions have been written for alternator 0 120 340 006.

Obtain the differing models of the alternators from the pertinent service part microfiches.



## 5. Test equipment, tools

### 5.1 Test equipment

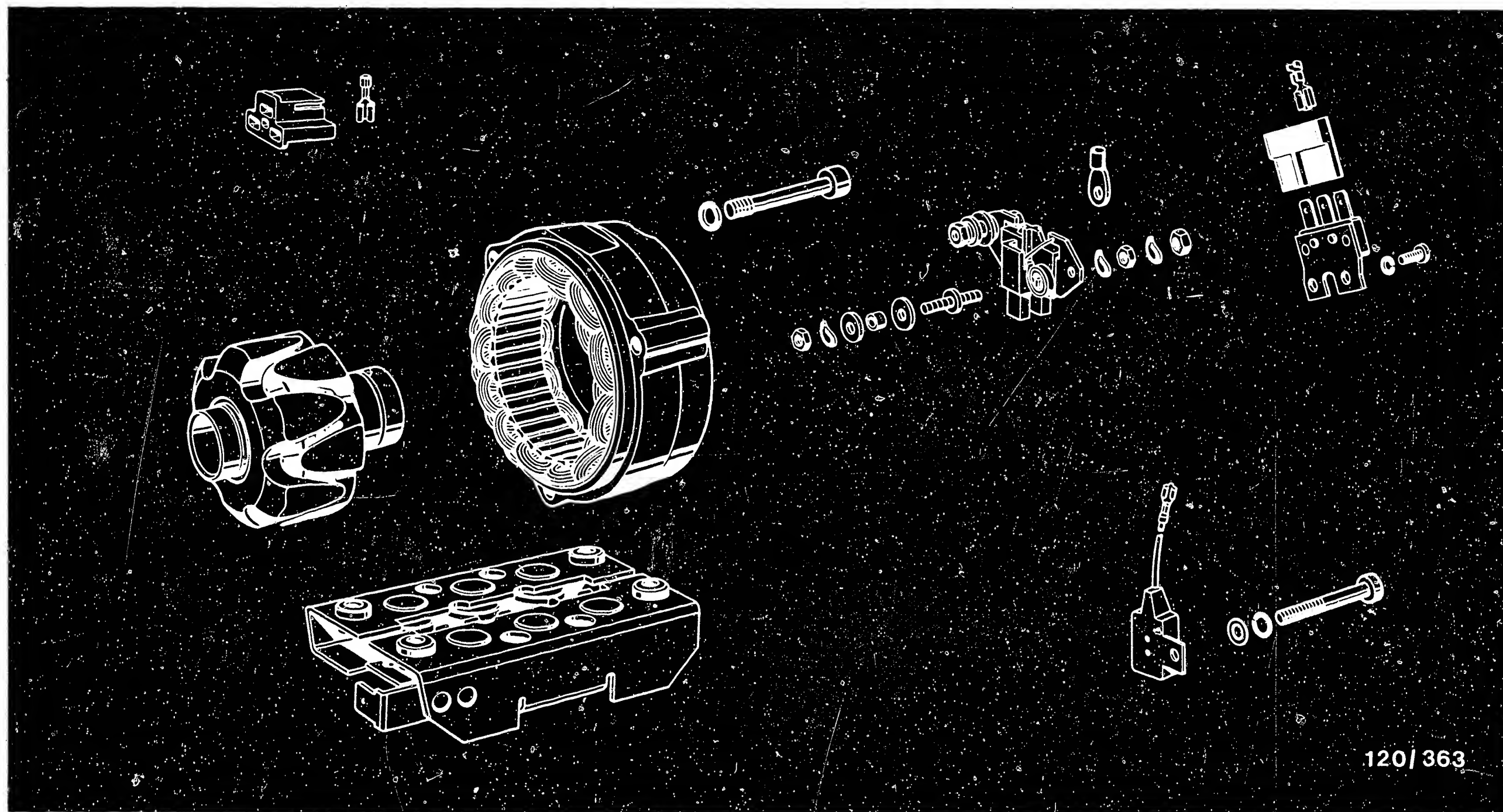
|  |                              |  |
|--|------------------------------|--|
| Volt-ampere tester                     | ETT 011.00                   | 0 684 101 100                              |
| Electric tester                        | ETE 014.00                   | 0 684 101 400                              |
| Oscilloscope                           | (all models)                 |  |
| or                                     |                              |  |
| Bosch Motortester                      | e.g. MOT 300                 | 0 684 000 201                              |
| Voltage stabilizer<br>up to 30 V       |                              | Commercially<br>available                  |
| Test panel                             | EFAW 81<br>or KDAW 9984      | 0 681 169 013                              |
| Transformer panel                      | EFAW 82<br>or KDAW 9985      | 0 681 169 014                              |
| Insulation tester<br>or<br>Test points | EFAW 84<br>KDAW 9983         | (supplied with<br>EFAW 81 or<br>KDAW 9984) |
| Dial indicator                         | EFAW 7                       | 1 687 233 011                              |
| Magnetic instrument<br>stand           | T-M1<br>(EW/MS1 B1           | 4 851 601 124<br>0 601 980 001)            |
| 3-phase alternator<br>tester           | EFAW 192<br>or<br>WPG 012.00 | 0 681 101 403<br>0 684 201 200             |
| 3 feeler gauges<br>0.15...0.6 mm       | KDZV 7399                    |  |



## 5.2 Tools

|                               |                          |
|-------------------------------|--------------------------|
| Mandrel for collector rings   | KDLI 6012                |
| Clamping pin for arbor press  | KDLI 6010                |
| Clamping support              | KDAW 9999                |
| Arbor press                   | (Commercially available) |
| 2 V blocks                    | (Commercially available) |
| Soldering iron 180 W          | (Commercially available) |
| Extractor for collector rings | (Commercially available) |
| Punch                         | (Commercially available) |





120/363

6. Exploded diagram of alternator 0 120 340 ..., (G1 (RL) 14 V..A..)

**A13**

Exploded diagram

Motorcycle alternators 0 120 340 ..



**A14**

Exploded diagram

Motorcycle alternators 0 120 340 ..



## 8. Trouble-shooting

8.1 Trouble-shooting has been broken down into the trouble-shooting chart (customer complaint), oscilloscope testing, regulated voltage testing, and power testing. It is then continued using the detailed trouble-shooting according to "frequent types of defects".

### 8.2 Using the trouble-shooting chart

The trouble-shooting chart starting at coordinates B 3 includes defect symptoms, defect causes, test instructions, and indications for coordinates. Select the possible defect cause in the trouble-shooting plan that corresponds to the customer complaint (defect symptom).

If according to the trouble-shooting chart, the defect cause is clearly identified, a targeted trouble-shooting can be done via the coordinates indicated.

If no coordinates are shown, the trouble-shooting must be carried out in accordance with the column "test instructions".

### 8.3 Using the trouble-shooting "frequent types of defects"

Starting from coordinates B 19, trouble-shooting has been organized into 3 columns of boxes.

The column at the left contains test instructions and test specifications.

The column in the middle contains repair instructions.

The column at the right includes the figures/wiring diagrams that go with the text, and the legends for them.

If the questions posed in the column at the left can be clearly answered with "yes", proceed to the next test below.

If the answer is "no", you must shift to the center column and carry out the tests indicated there.

### 8.4 Prerequisites for testing

Check the customer complaint.

Battery charged, electrolyte density min.  $1.24 \text{ g/cm}^3$ .

A fully charged battery (electrolyte density  $1.28 \text{ g/cm}^3$ ) is required to measure the regulated voltage because a non-fully charged battery acts for too long as an attenuator if there is a regulator short (for excitation).

Battery connected to vehicle electrical system.

Check the ground strap engine-frame for good connection.

Engine mechanically O.K. (e.g. seal rings on the crankshaft)

Ambient temperature  $+20...+30^\circ\text{C}$ . (The temperature strongly affects the measured values).

Alternator temperature min.  $+60^\circ\text{C}$ .

**B1**

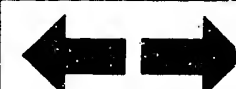
Trouble-shooting

Motorcycle alternators 0 120 340 ..

**B2**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



# Trouble-shooting chart

Customer complaint (defect symptom)

One or more defects can be causing the defect symptoms listed below.

1. Charge indicator light does not turn on with ignition turned on and motor at standstill

2. Charge indicator light lights with ignition turned off

3. Charge indicator light does not go off with engine running (glows or flickers)

4. Starting motor does not turn, engine does not start (weak battery charging)

5. Overcharging of the battery (development of gas)

|   |   |   |   |   | Cause of defect   | Test instructions  | Coordinates |
|---|---|---|---|---|---|--|-------------|
| ● | ● | ● | ● | ● | Unclear   | Connect oscilloscope. Check regulated voltage. Run power test.   | B 7         |
| ● |   |   | ● |   | No voltage at Terminal 15 on the ignition and starting switch   | Check leads and connections to them  | B 19        |
| ● |   |   | ● |   | Break/contact resistance in lead from the ignition and starting switch via the charge indicator light to D+ and the alternator. | Using an ohmmeter, check lead for break/contact resistance.  | B 19        |
| ● |   |   | ● |   | Break/contact resistance in lead Terminal 30 on the battery to the ignition and starting switch.                                | Using ohmmeter, check the lead for break/contact resistance.   | B 19        |
| ● |   |   | ● |   | Open circuit in the regulator   | Take out and replace the regulator   | B 19        |
| ● |   |   | ● |   | Open circuit in the carbon brushes (broken off)   | Collector rings out-of-round, crankshaft bearing not O.K., collector rings or carbon brushes covered with oil. | -           |
| ● |   |   | ● |   | Grounding or open circuit in the alternator   | Take parts out and check individually.   | -           |

**B3**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



**B4**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



Trouble-shooting chart (continued)  
Customer complaint (defect symptom)

One or more defects can be causing the defect symptoms listed below.

1. Charge indicator light does not turn on with ignition turned on and motor at standstill
2. Charge indicator light lights with ignition turned off
3. Charge indicator light does not go off with engine running (glows or flickers)
4. Starting motor does not turn, engine does not start (weak battery charging)
5. Overcharging of the battery (development of gas)

|   |   |   |   |   | Cause of defect  | Test instructions                   | Coordinates |
|---|---|---|---|---|--|-------------------------------------|-------------|
| ● |   |   | ● |   | Open circuit in collector rings, rotor winding, D + connection | Take parts out, check individually. | B 23        |
| ● | ● | ● | ● |   | Rectifier defective  |                                     | B 19, B 21  |
|   |   | ● |   | ● | Regulated voltage too high<br>rotor short                      | Take out and replace regulator      | C 3         |
|   |   | ● | ● |   | Regulated voltage too low                                      | Take out and replace regulator      | C 1         |
| ● |   |   | ● |   | Ground strap engine - vehicle body defective                   | Take out and replace ground strap   | -           |
|   |   |   | ● |   | Generator drive defective (links)                              | Repair                              | -           |

**B5**

Trouble-shooting

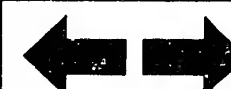
Motorcycle alternators 0 120 340 ..



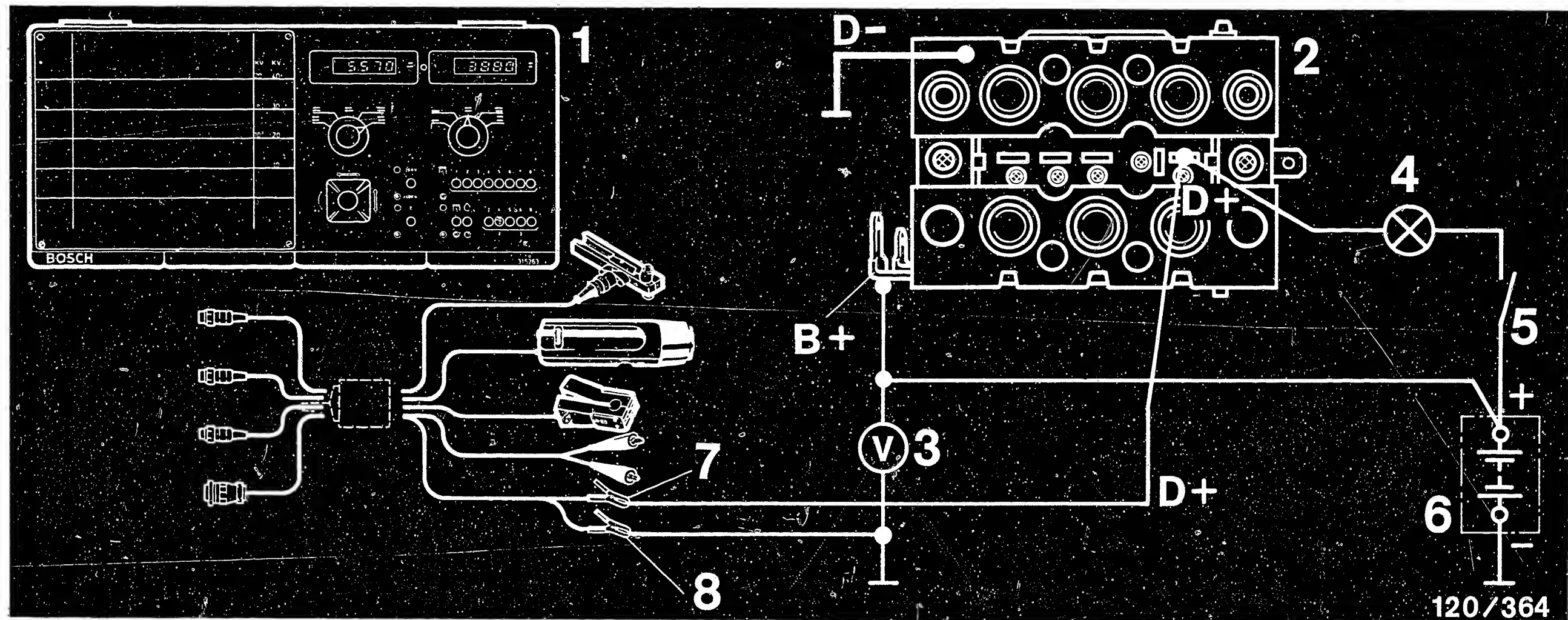
**B6**

Trouble-shooting

Motorcycle alternators 0 120 340 ..







1 = Oscilloscope  
2 = Rectifier

3 = Voltmeter  
4 = Charge indicator light

5 = Ignition and starting switch  
6 = Battery

7 = Red terminal  
8 = Black terminal

### 8.5 Oscilloscope test on alternator

The oscilloscope test includes identification of defects in the alternator by means of defect patterns (diode and phase defects).

#### 8.5.1 Connecting the oscilloscope

Connect the oscilloscope to the rectifier using the test lead that goes with it (see figure above).

Red terminal to D+ connection, black terminal to D- connection (ground). Connect the voltmeter between B+ on the rectifier and B-.

Start the engine and operate it at a speed of approx. 2000 min<sup>-1</sup>. Compare the oscillogram appearing on the screen with the oscillograms shown on the coordinates that follow. If the oscillograms differ from the "good" oscillogram, take out the stator, rotor, regulator, and rectifier. Check individual parts (see starting from coordinates D1).

If the oscillogram is good, check with regulated voltage and continue power test on coordinates E 10.

**B7**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



**B8**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



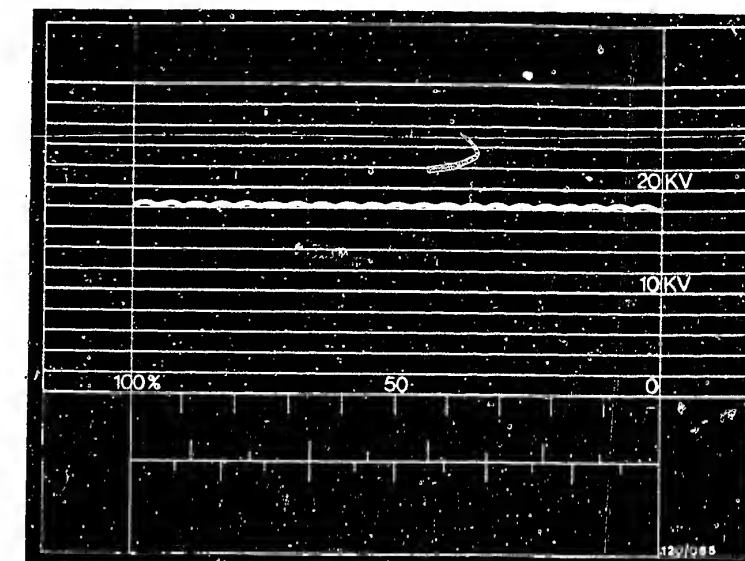
### "Good" oscillogram

If the alternator is in proper condition, this pattern is obtained. The DC voltage has a slight ripple. The oscillogram shown can have small peaks if the alternator regulator is working. The regulator can be "set still" by adding load (e.g., loading resistor).

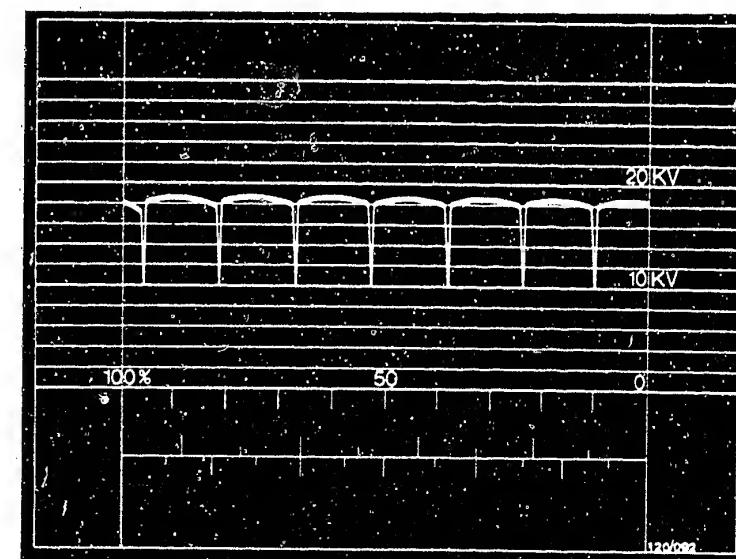
Adjust the height of the pattern in such a way that the ripple lies between 2 adjacent kV lines.

In order to make it possible to compare such patterns, adjust the pattern in question using the vertical control on the oscilloscope so that it fits in approximately between the 10 and 20 kV lines.

Note: Several defects can occur simultaneously.



Oscilloscope shows phase defects (open circuit)



**B9**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



**B10**

Trouble-shooting

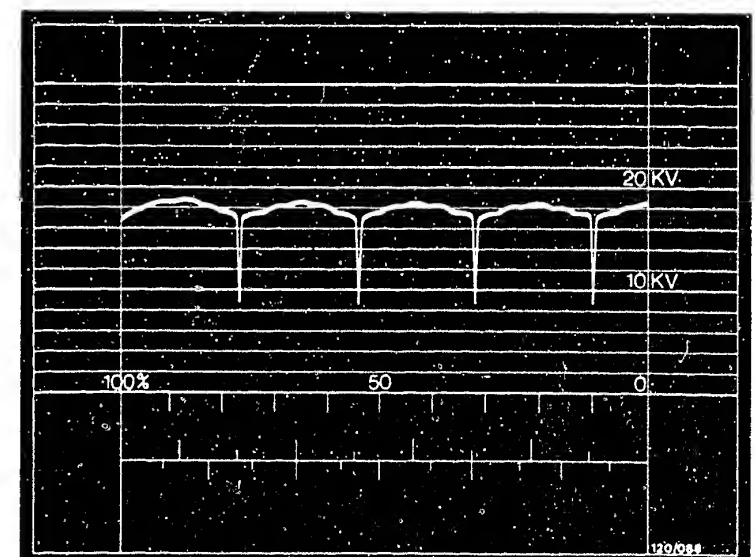
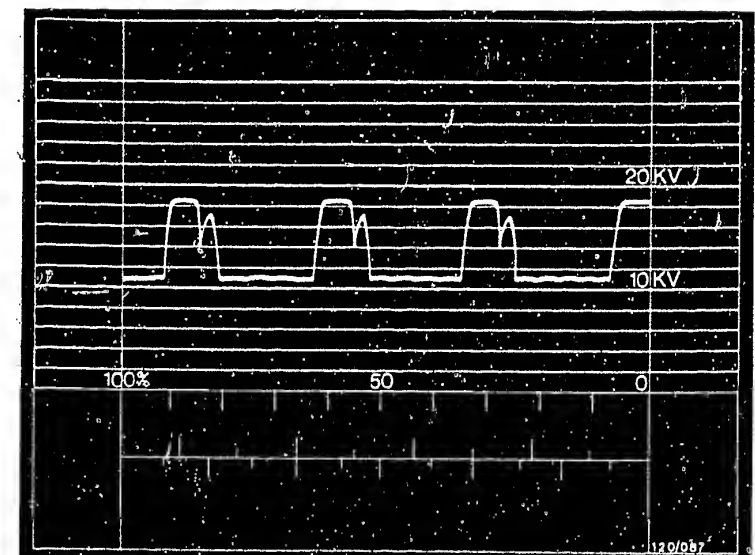
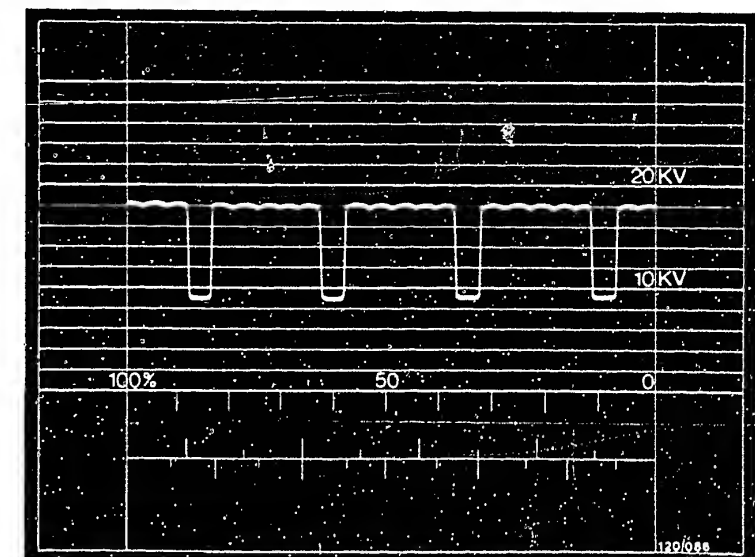
Motorcycle alternators 0 120 340 ..



Oscillogram shows an open circuit in an exciter diode.

The oscillogram shows an open circuit in a positive diode.  
If several diodes are connected in parallel in an alternator,  
this oscillogram appears only if all the diodes have an  
open circuit.

Oscillogram shows an open circuit in a negative diode.  
If several diodes are connected in parallel in an alternator,  
this oscillogram appears only if all the diodes have an open  
circuit.



**B11**

Trouble-shooting

Motorcycle alternators 0 120 340 ..



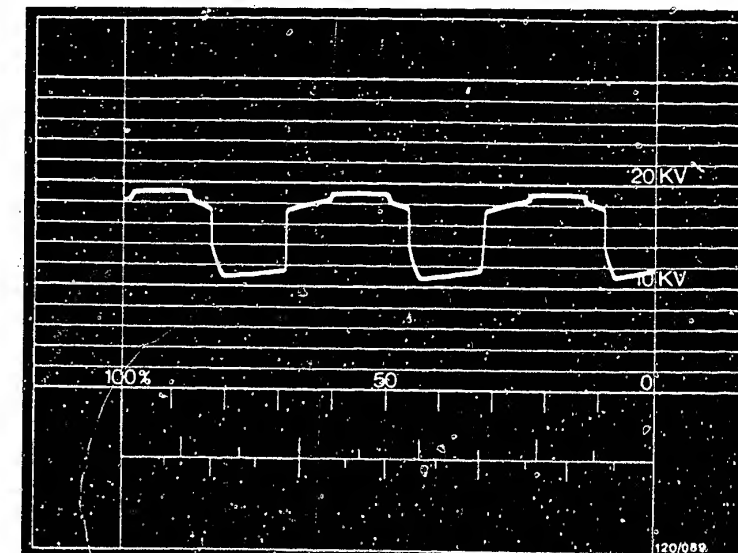
**B12**

Trouble-shooting

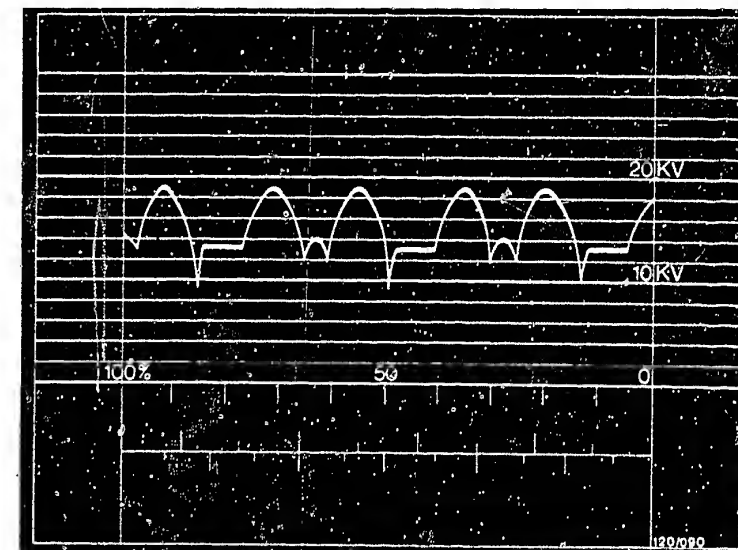
Motorcycle alternators 0 120 340 ..



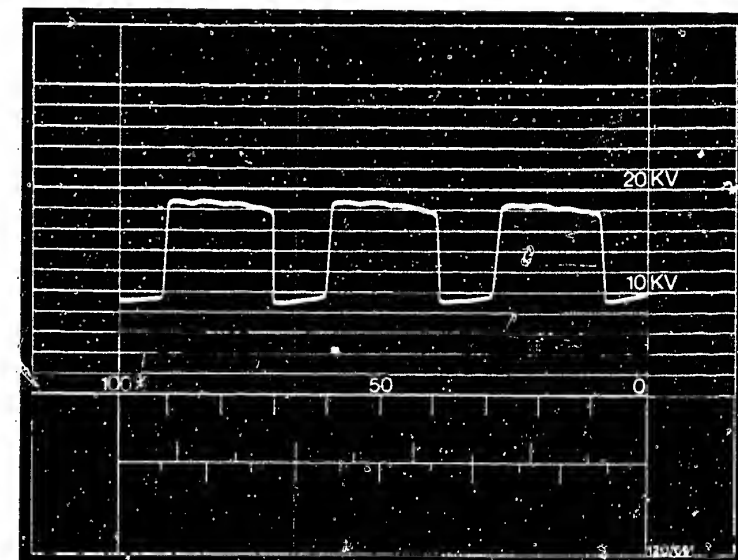
The oscillogram shows a short in an exciter diode.



The oscillogram shows a short in one or more positive diodes.



The oscillogram shows a short in one or more negative diodes.



**B 13**

Trouble-shooting

Motorcycle alternators 0 120 340 ..

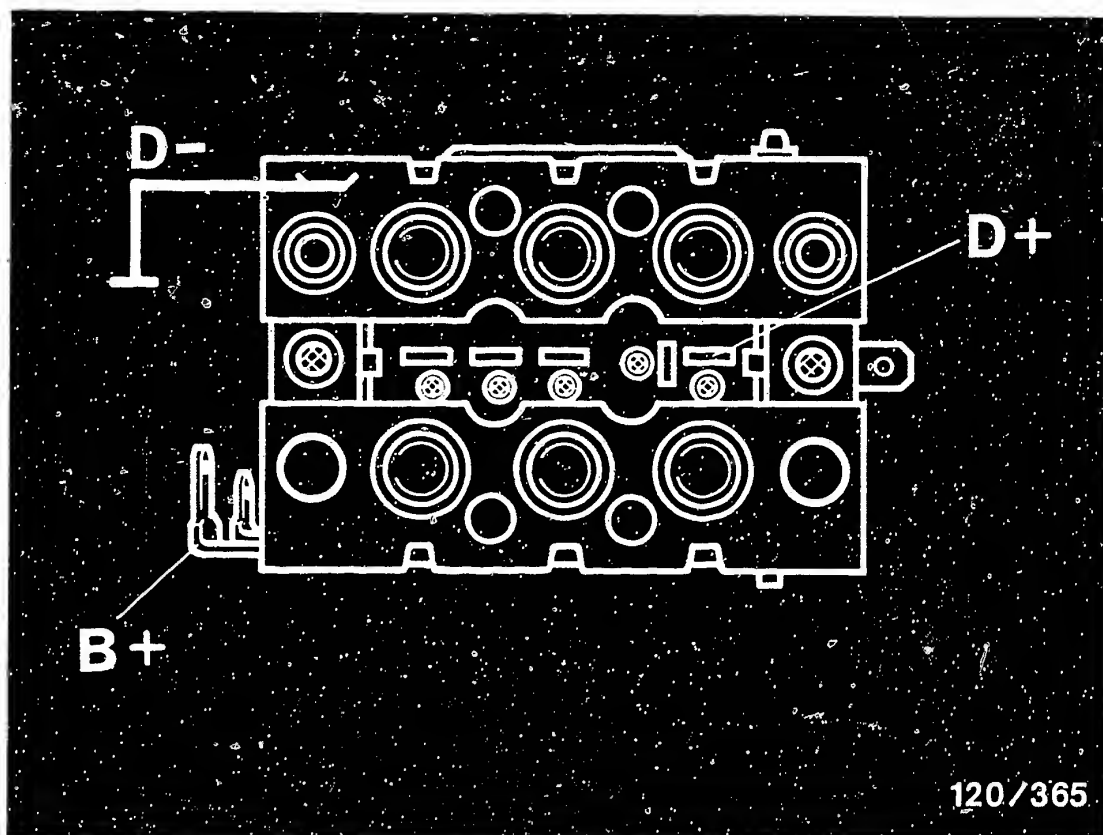


**B 14**

Trouble-shooting

Motorcycle alternators 0 120 340 ..





## 8.6 Checking the separate transistor regulator (EF) 0 192 062:

### 8.6.1 Checking regulated voltage in the vehicle

Connect the voltmeter to the rectifier according to operating instructions (see figure).

Start the engine and operate it at a speed of approx. 2000 min<sup>-1</sup>.

Measure regulated voltage from B+ on the rectifier to D-.

Specified value: Regulator 0 192 062 002 (EF)

13.7...14.5 V

at a load

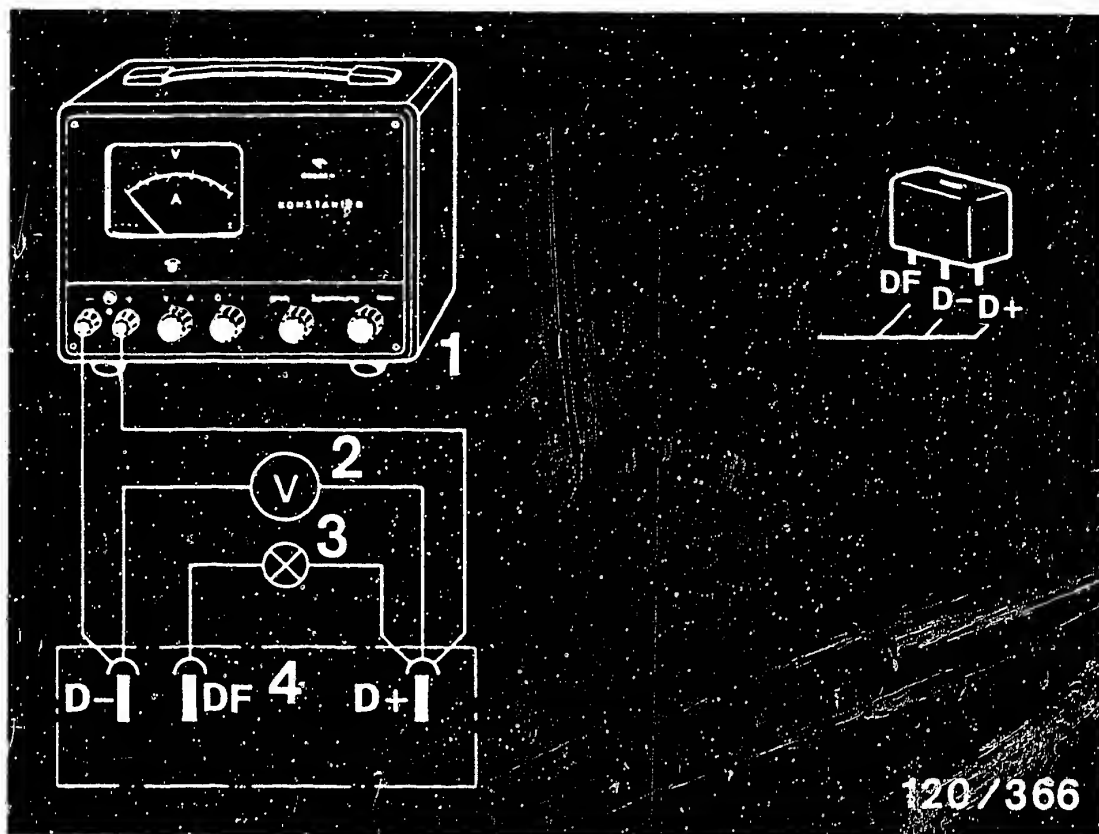
≤ 10 A

If the alternator is cold, read within a minute. If the engine and generator are warm, the value can be lower by 0.5 V.

If the test specification is attained, the regulator is O.K.

If the test specification is not attained, take out the regulator and check it with the voltage stabilizer.





- 1 = Voltage stabilizer
- 2 = Voltmeter
- 3 = Test bulb 12V 10 W
- 4 = Regulator

#### 8.6.2 Checking the separate transistor regulator with voltage stabilizer

Set up the test circuit as shown in the wiring diagram (see figure).

Increase the voltage on the voltage stabilizer.

Test bulb lights. The test bulb must go out in the range of tolerances for regulated voltage from 13.7 ... 14.5 V. If these values are obtained, the regulator is O.K. Otherwise take out and replace the regulator.



8.7 Power test

Connect the volt-ampere tester to the rectifier B+ and D- according to operating instructions (see figure).

Start the engine.

Set the rotational speed for the alternator according to the table below.

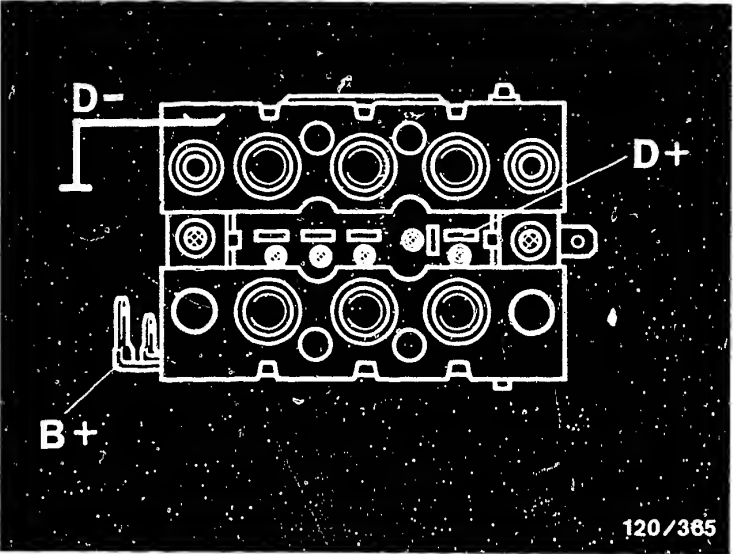
Using a loading resistor, adjust the load according to the table below.

When the prescribed speed and load have been attained, the alternator voltage must not be more than 13.0 V.

Specified values for warm alternator (+60°C) with regulator

| Alternators<br>0 120 340 ..  | Rotational speed<br>min <sup>-1</sup> | Load current<br>A |
|------------------------------|---------------------------------------|-------------------|
| 005<br>G1 (RL) 14 V 18A22    | 1350<br>2200<br>5000                  | 5<br>12<br>18     |
| 006<br>G1 (RL) 14 V 20A18    | 1050<br>1800<br>7000                  | 5<br>13<br>19     |
| 002/004<br>G1 (RL) 14V 20A21 | 1300<br>2100<br>7000                  | 5<br>13<br>20     |

If the specified values are not attained, take out the stator, rotor and rectifier. Check individual parts (starting from coordinates D1).





## 9. Frequent types of defects

### 9.1 Charge indicator light does not turn on with ignition turned on and engine at standstill

Check voltage supply to charge indicator light.

Connect voltmeter to ignition and starting switch Term. 15. Turn on ignition and starting switch.

Is there battery voltage present?

no

Check ignition and starting switch. (Continuity Term. 30 to Term. 15) Check for a break in the lead battery + to ignition and starting switch Term. 30. Eliminate any break.

yes

Put in test bulb 12V/2 W between Term. 15 and D+.

Does the bulb light?

no

1. Open circuit in the regulator (take out and replace regulator)
2. Check for break in leads D+, DF, D- to rectifier or to carbon brush holder with carbon brushes. Eliminate any break.
3. Check current consumption of rotor. Disconnect the control plug and connect the electric tester to DF and D-. Specified value 2.4...4.5 A. If the value obtained is above or below that, take out and replace the stator. Then check the alternator with the engine running as described starting from coordinates E 1.

yes

Charge indicator light defective or break in lead from the ignition and starting switch via the charge indicator light to Term. 61 on the alternator.

Are the leads and connections O.K.?

Does the charge indicator light turn on?

no

Eliminate any break.

yes

Check the alternator with the engine running as described starting from coordinates E1.





## 9.2 Charge indicator light turns on with ignition switched off

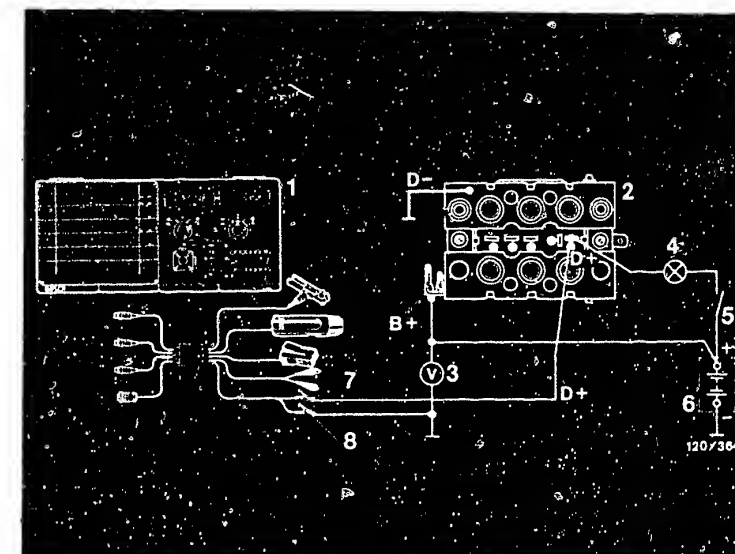
Check alternator with oscilloscope  
Connect oscilloscope to rectifier (see figure at top).  
Start engine and operate it at approx. 2000 min<sup>-1</sup>.  
Compare the oscillogram with the figure at the bottom.  
Is the charge indicator light now off?

no

Take out the rectifier, eliminate diode defect.  
(Take out and replace rectifier)

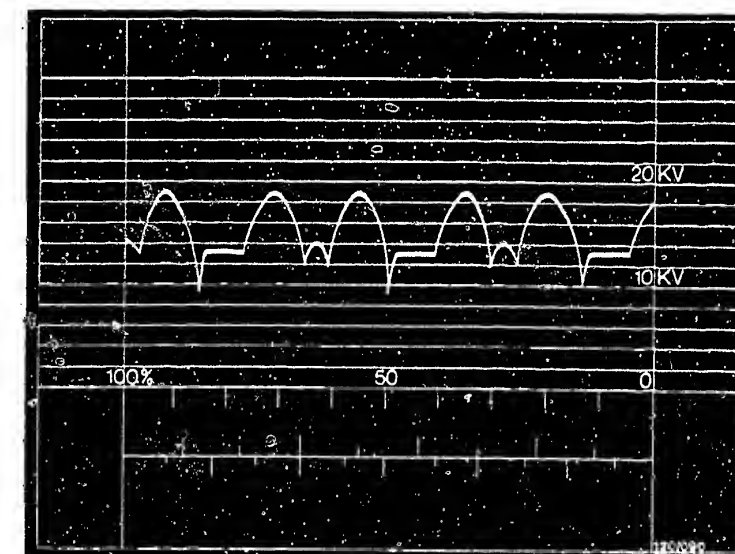
yes

Check the alternator with the regulator with the engine running. See coordinates E1



- 1 = Oscilloscope
- 2 = Rectifier
- 3 = Voltmeter
- 4 = Charge indicator light
- 5 = Ignition switch
- 6 = Battery
- 7 = Red terminal
- 8 = Black terminal

The oscillogram shows short in one or more positive diodes.



**B21**

Frequent types of defects

Motorcycle alternators 0 120 340 ..



**B22**

Frequent types of defects

Motorcycle alternators 0 120 340 ..



### 9.3 The charge indicator light does not go off when the engine is running

Check the alternator with the oscilloscope and regulated voltage

Connect the oscilloscope and the voltmeter to the rectifier (see figure at top). Start engine and operate it at  $2000 \text{ min}^{-1}$ . If the "good" oscillogram appears (see diagram at bottom) and if the regulator voltage is between  $13.7 \dots 14.5 \text{ V}$ , the alternator is O.K. Are the oscillogram and regulated voltage O.K.?

no

If the voltage and oscillogram deviate, the alternator is defective. Take out the stator, rotor, and rectifier and check individual parts as described starting from coordinates D1.

If the voltage value deviates but the oscillogram is O.K., take out and replace regulator.

yes

Check power supply to the charge indicator light.

Shut off engine.

Using a voltmeter on the charge indicator light Term. 15, check whether there is approx. battery voltage present. Is there battery voltage present?

no

1. Check for a break in the lead from battery Term. 30 to the ignition and starting switch. Eliminate any break.

2. Check ignition and starting switch for continuity Term. 30 to Term. 15.

If there is no continuity, take out and replace the ignition and starting switch.

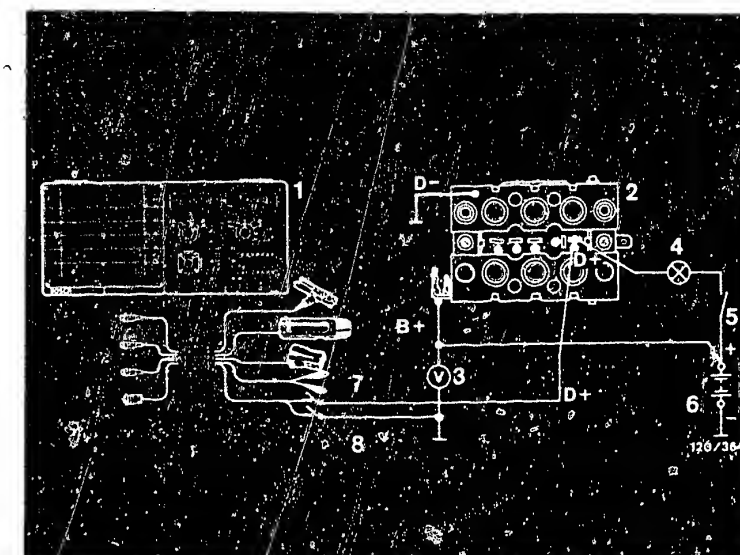
yes

Check the lead from the charge indicator light to Term. D+/61 on the rectifier for grounding. Eliminate the grounding.

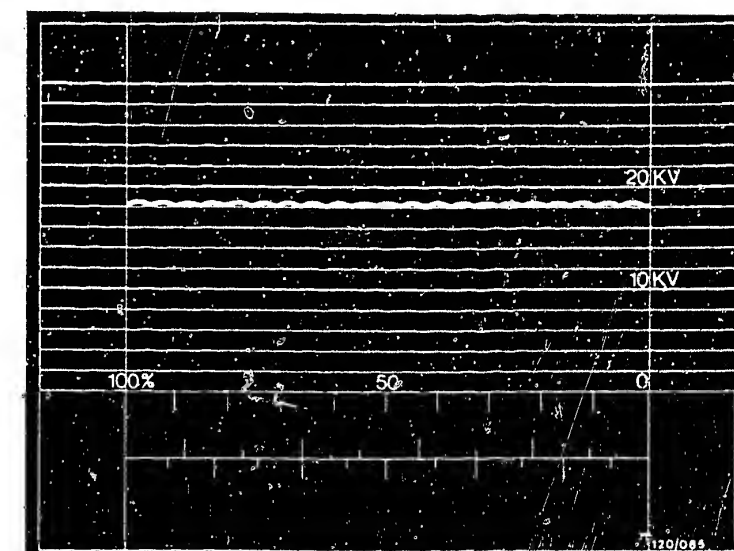
Does the charge-indicator light go out?

yes

Alternator O.K.



- 1 = Oscilloscope
- 2 = Rectifier
- 3 = Voltmeter
- 4 = Charge indicator light
- 5 = Ignition and starting switch
- 6 = Battery
- 7 = Red terminal
- 8 = Black terminal



**B23**

Frequent types of defects

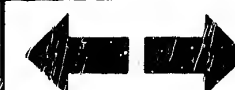
Motorcycle alternators 0 120 340 ..



**B24**

Frequent types of defects

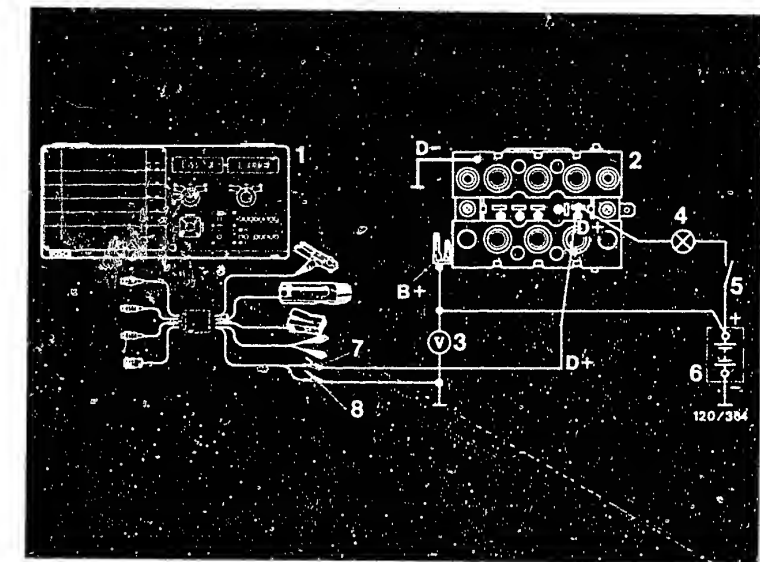
Motorcycle alternators 0 120 340 ..



9.4 Weak battery charging (starting difficulties)  
 Check continuous consumption (connect ohmmeter between connecting terminal battery positive and battery pole). The continuous consumption (e.g., light, ignition, etc.) is not to exceed approx. 2/3 of the max. power of the alternator. Approx. 1/3 of the max. power has been provided for battery charging.

Check alternator with oscilloscope and volt-ampere tester.  
 Connect oscilloscope and volt-ampere tester to rectifier according to operating instructions (see figure at top).  
 Check regulated voltage  
 Start engine and operate it at approx. 2000 min<sup>-1</sup>.  
 Specified value for regulated voltage 13.7...14.5 V  
 with loading ≤ 10 A  
 Is regulated voltage attained?

Compare oscillogram on the screen with figure below.  
 If the "good" oscillogram is there, regulator is defective. Take it out and replace it.  
 If a different oscillogram appears, the generator is defective. Take out the stator, rotor, and rectifier and repair them (see starting from coordinates D14).



- 1 = Oscilloscope
- 2 = Rectifier
- 3 = Voltmeter
- 4 = Charge indicator light
- 5 = Ignition switch
- 6 = Battery
- 7 = Red terminal
- 8 = Black terminal

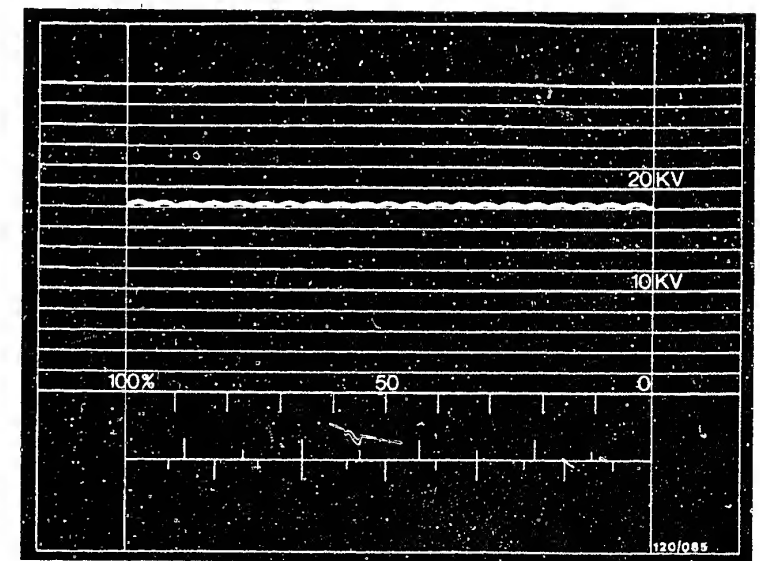
Run power test (warm alternator (+60°C) with regulator)  
 Hold regulated voltage at 13 V by means of loading.

| Alternators<br>0 120 340 .. | Rotational<br>speed min <sup>-1</sup> | Load<br>current<br>A |
|-----------------------------|---------------------------------------|----------------------|
| 005                         |                                       |                      |
| G1 (RL) 14V 18A22           | 1350                                  | 5                    |
|                             | 2200                                  | 12                   |
|                             | 5000                                  | 18                   |
| 006                         |                                       |                      |
| G1 (RL) 14V 20A18           | 1050                                  | 5                    |
|                             | 1800                                  | 13                   |
|                             | 7000                                  | 19                   |
| 002/004                     |                                       |                      |
| G1 (RL) 14V 20A21           | 1300                                  | 5                    |
|                             | 2100                                  | 13                   |
|                             | 7000                                  | 20                   |

Take out, and repair stator, rotar and rectifier (see Coordinates D14 and ffg.).

Are values for power attained?  
 yes  
 Alternator O.K.

"Good" oscillogram



## 9.5 Overcharging of the battery (development of gas)

Check operation of the charge indicator lamp.

Is the charge indicator light on when the engine is at standstill and the ignition is on, does it go out when the engine runs, and is it off when the ignition is off and the engine is at standstill?

yes

Check regulated voltage

Connect voltmeter to rectifier (B+ and D-).

Start engine and operate it at approx. 2000 min<sup>-1</sup>.

Specified value for regulated voltage 13.7...14.5 V with  $\leq 10$  A load.

Is regulated voltage O.K.?

yes

Alternator O.K.  
Check battery.

no

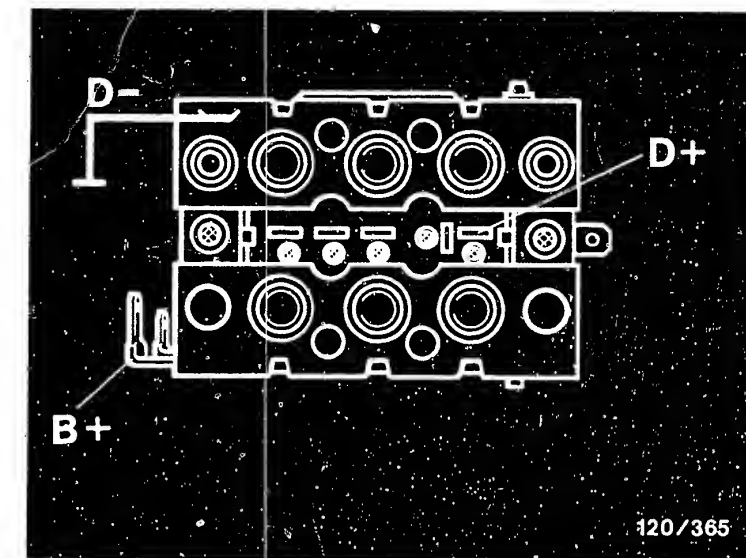
Check current consumption of rotor

Disconnect the regulator plug and connect electric tester between DF and D-. Specified value 2.5...4.5 A.

If the specified value is O.K., take out and replace the regulator.

If the specified value is not O.K., take out and replace the rotor. Then check the regulated voltage again.

Specified value 13.7...14.5 V with  $\leq 10$  A loading.



**C3**

Frequent types of defects

Motorcycle alternators 0 120 340 ..

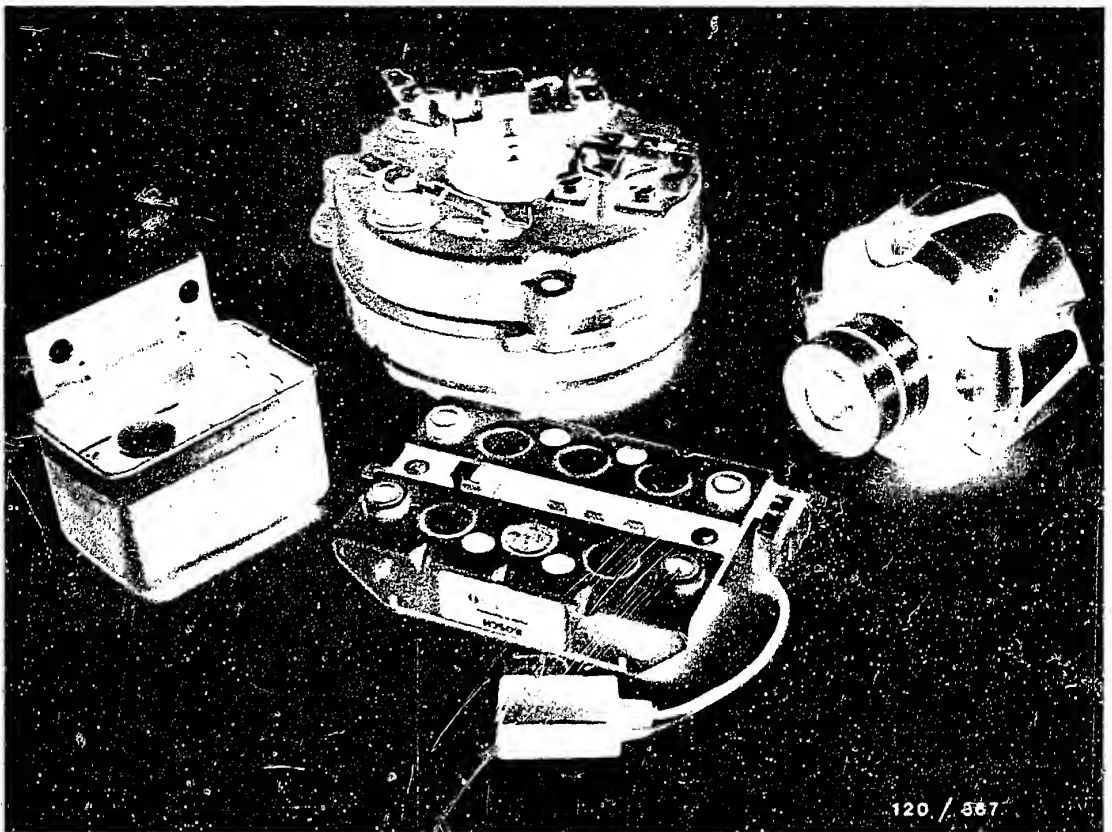


**C4**

Frequent types of defects

Motorcycle alternators 0 120 340 ..





10. Disassembling the alternator (regulator, rectifier, stator, rotor)

Disconnect the regulator plug, remove fastening screws. Take off regulator.

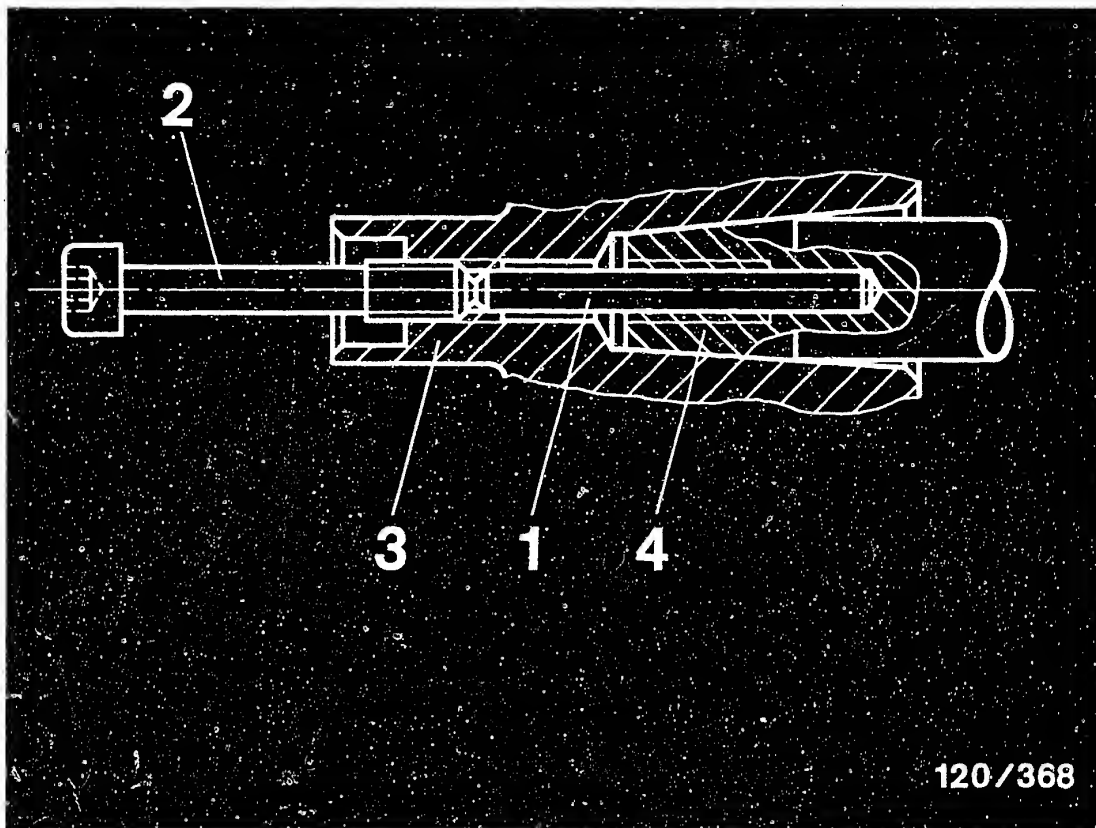
Disconnect plug connections on the rectifier, remove fastening screws, pull off the suppression capacitor. Take off the rectifier.

**D1**

Disassembling the alternator

Motorcycle alternators 0 120 340 ..





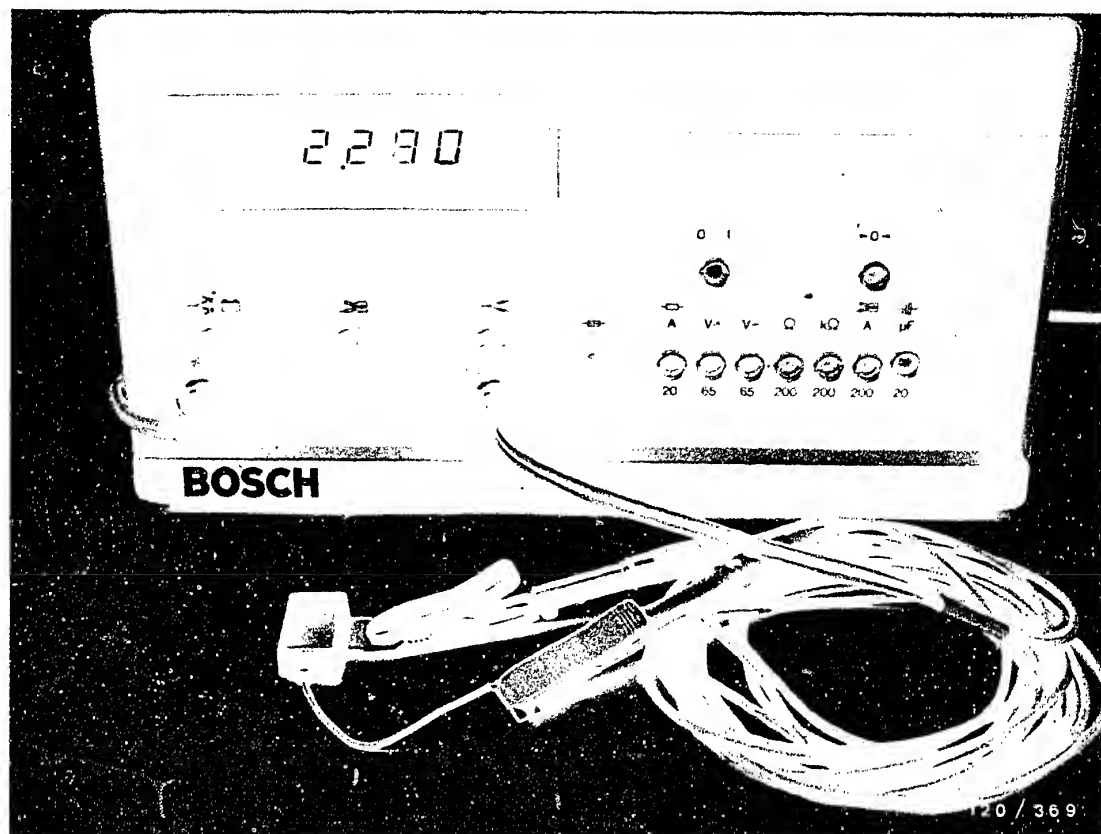
120/368

- |                     |                 |
|---------------------|-----------------|
| 1 = Round rod       | 3 = Rotor       |
| 2 = Fastening screw | 4 = Drive shaft |

Remove alternator cover. Release the electrical connections on the stator. Take off 3 socket hex screws and stator.

Take the fastening screw for the rotor out completely. Insert the round rod with dia. 6 mm and length 56 mm and screw the fastening screw back in. Take off the rotor.





## 11. Checking components of the alternator

### 11.1 Checking the suppression capacitor

Connect suppression capacitor to electric tester ETE 014.00 (see figure). Watch the switch setting on the test device.

Specified value 1.8 ... 2.6  $\mu\text{F}$

If the specified value is not attained, take out and replace the suppression capacitor. It is defective. After the test, discharge the suppression capacitor by shorting it, so that no ignition of the cleaning fluid can result when the parts are being cleaned.

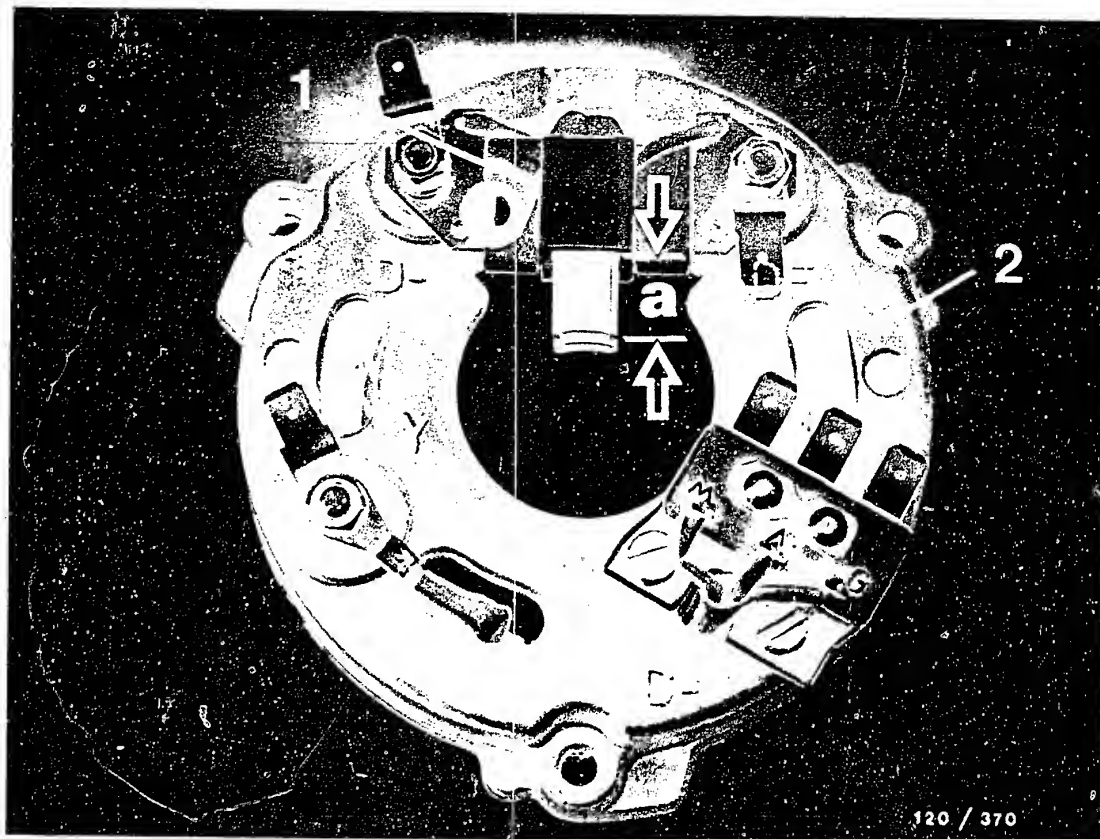
**D3**

Checking the components

Motorcycle alternators 0 120 340 ..







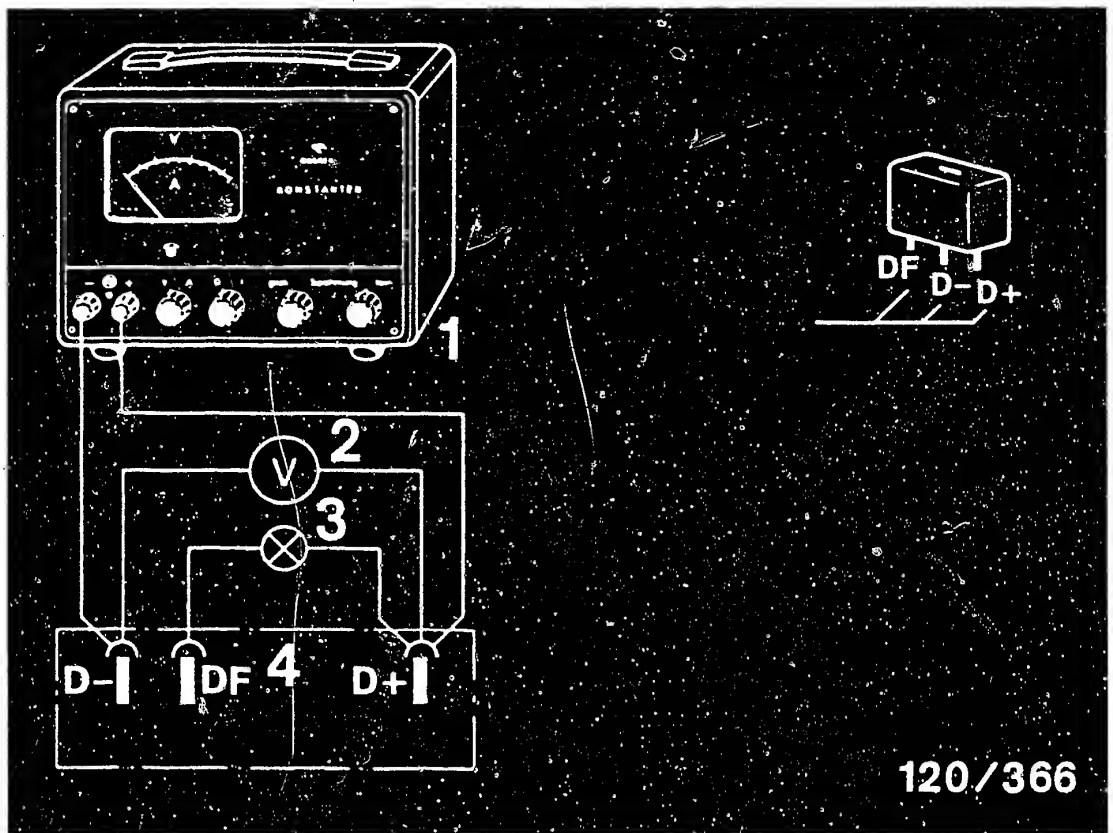
- 1 = Brush holder  
2 = Stator housing

### 11.2 Checking the carbon brushes

Check the brush holder for external damage by visual inspection.







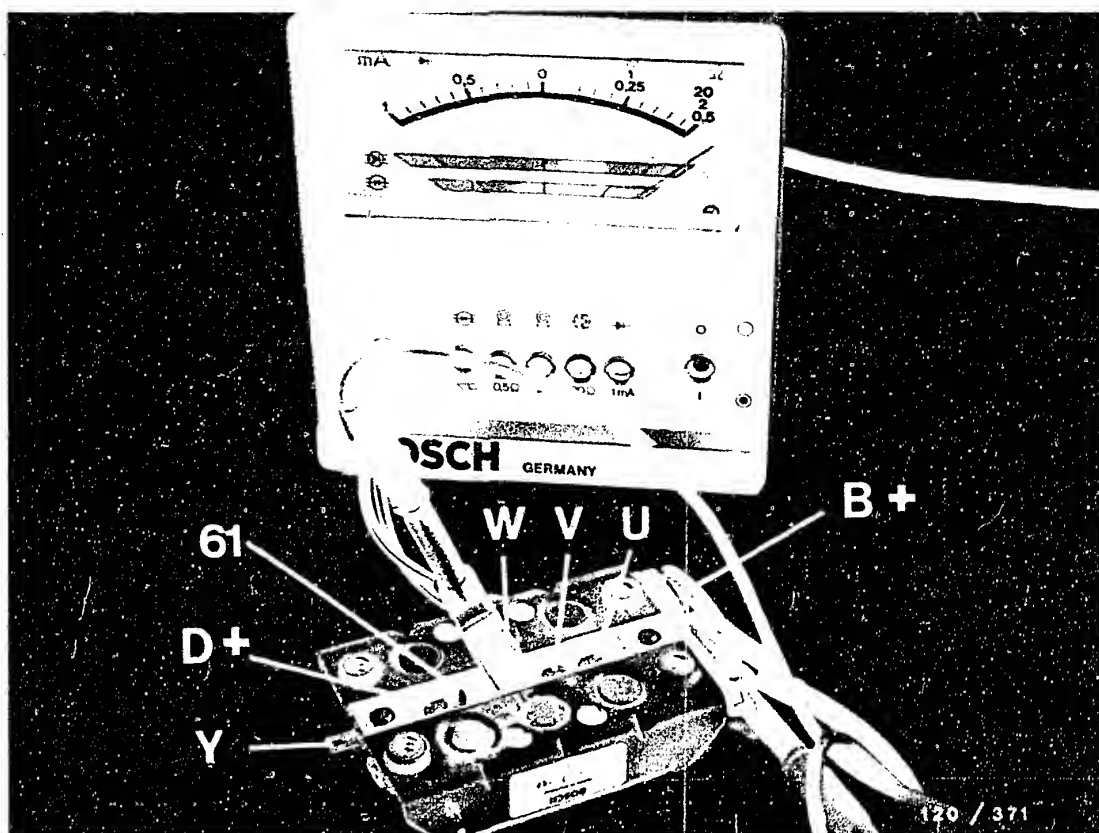
120/366

- 1 = Voltage stabilizer
- 2 = Voltage tester
- 3 = Test bulb 12 V 10W
- 4 = Regulator 0 192 062 ..

### 11.3 Check the separate transistor regulator EF, 0 192 062 ..

Set up the test circuit as shown in the wiring diagram. Increase voltage on the stabilizer. Test bulb lights. The test bulb must go out in the tolerance range for regulated voltage 13.7 ... 14.5 V. If these values are attained, the regulator is O.K. Otherwise take out and replace the regulator.





#### 11.4 Checking the rectifier

Check the operation of the rectifier in a wired condition using EFAW 192 or WPG 012.00.

Watch the switch setting on the test device.

Measuring points:

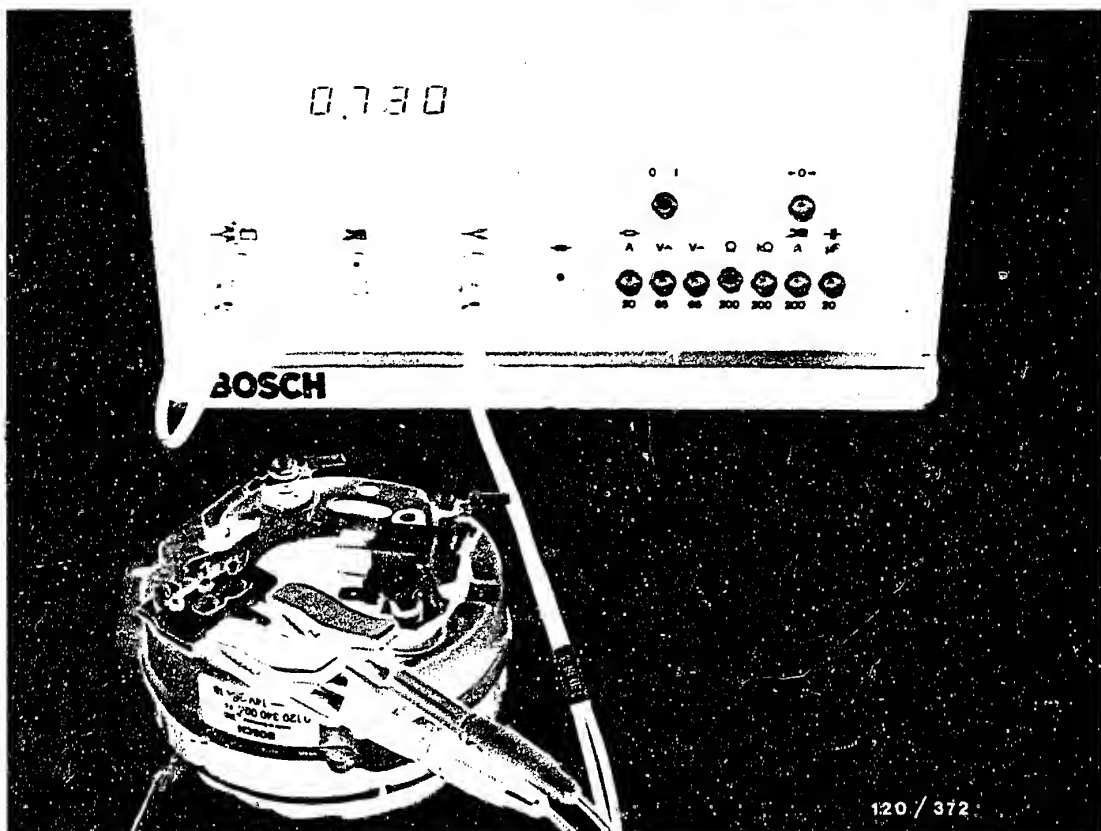
U, V, W → D+, B+, B-

Y → B-, B+

The rectifier is O.K. if the needle on the test device is in the green sector during these tests.

If one or more diodes are defective, take out and replace the complete rectifier assembly.





### 11.5 Checking the stator (resistance)

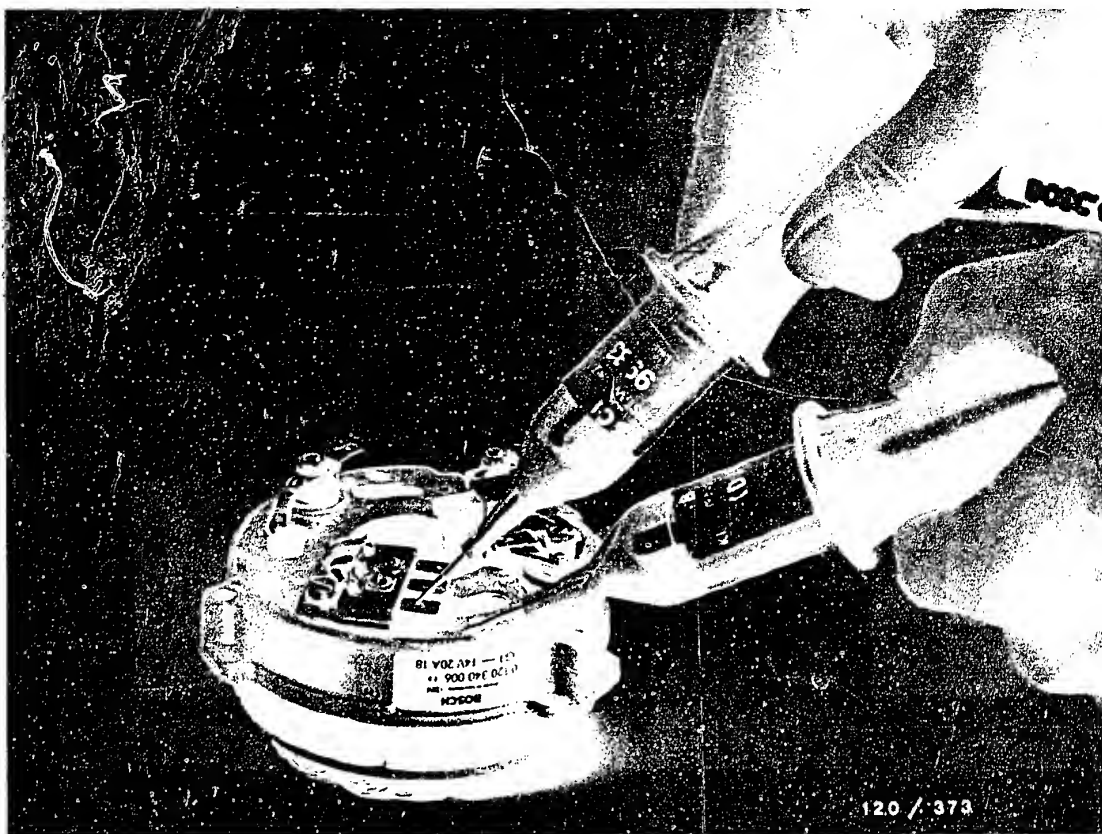
Connect the test device to the phase outlets (see figure).

Watch switch setting on test device.

| Alternators 0 120 340 ..     | Resistance value<br>$\Omega + 10\%$ |
|------------------------------|-------------------------------------|
| 005, G1 (RL) 14V 18A22       | 0.76                                |
| 006, G1 (RL) 14V 20A18       | 0.76 (0.62) <sup>1)</sup>           |
| 002/004<br>G1 (RL) 14V 20A21 | 0.76                                |

<sup>1)</sup> with stator 1 125 043 013

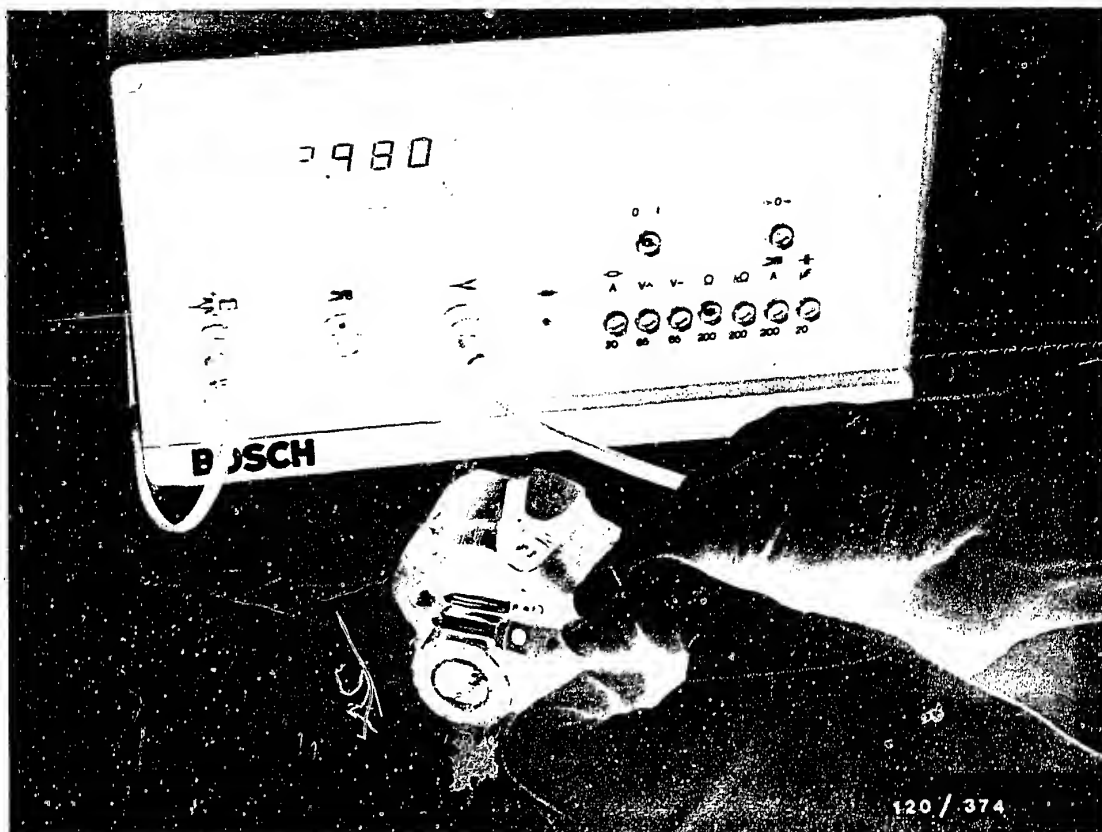




### 11.6 Checking the stator (ground)

Using test points EFAW 84 or KDAW 9983, check the stator for grounding (see figure).

Test voltage 80 V AC

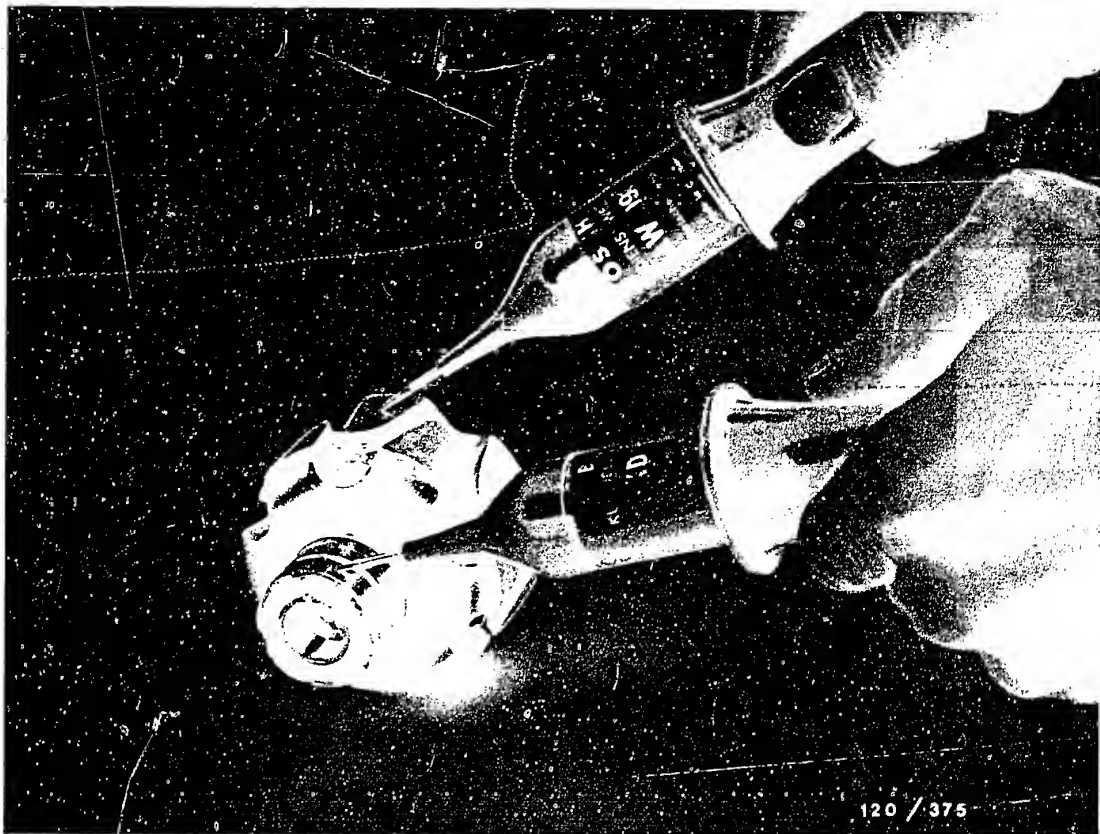


### 11.7 Checking the rotor (resistance)

Using the 3-phase alternator tester or the electric tester ETE 014.00, measure the rotor resistance.

| Alternators 0 120 340 ..     | Resistance value<br>$\Omega + 10\%$ |
|------------------------------|-------------------------------------|
| 005, G1 (RL) 14V 18A22       | 3.4                                 |
| 006, G1 (RL) 14V 20A18       | 2.8                                 |
| 002/004<br>G1 (RL) 14V 20A21 | 3.4                                 |

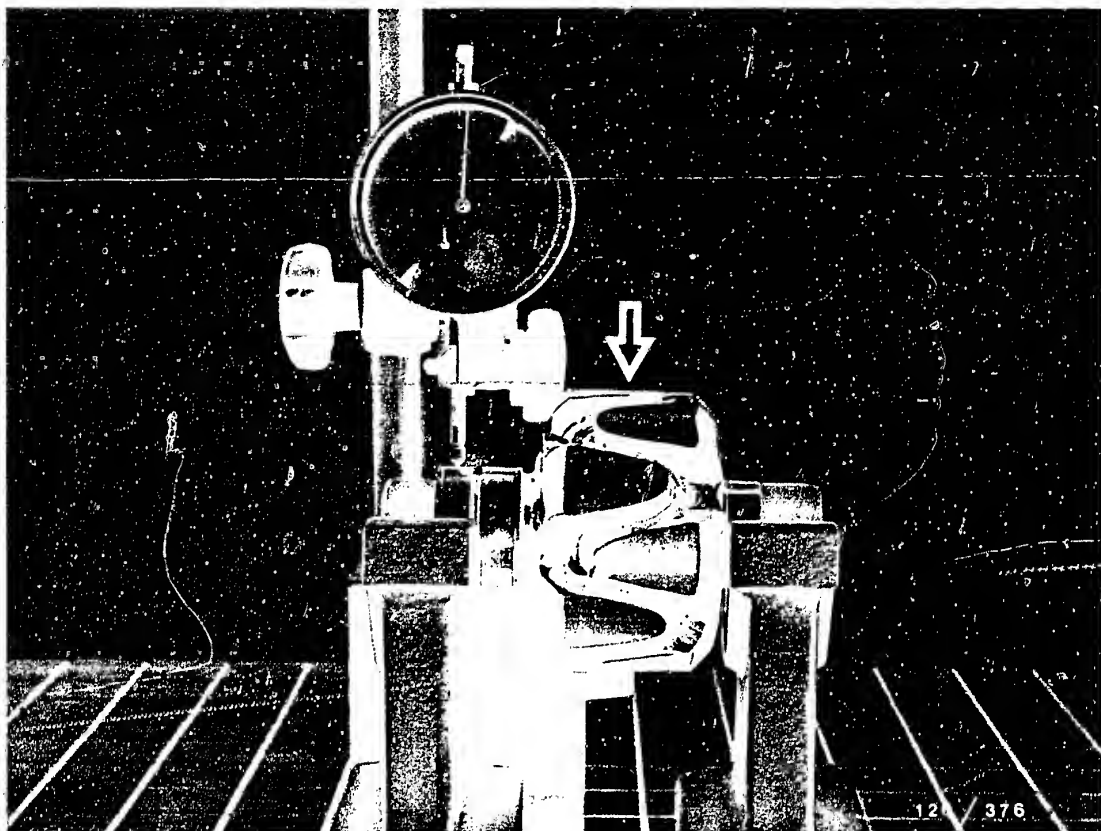




### 11.8 Checking the rotor (ground)

Using test points EFAW 84 or KDAW 9983, check the rotor for grounding.  
Test voltage 80 V AC.





### 11.9 Measurement of runout

Place the rotor in vee-support blocks at the bearing locations. Align it exactly horizontal. Measure the runout on the outside diameter of the rotor (figure, arrow) and on the outside diameter of the collector rings (see figure) using the magnetic instrument stand T-M1 (4 851 601 124) and dial indicator EFAW 7.

Max. deviation on the rotor 0.05 mm.

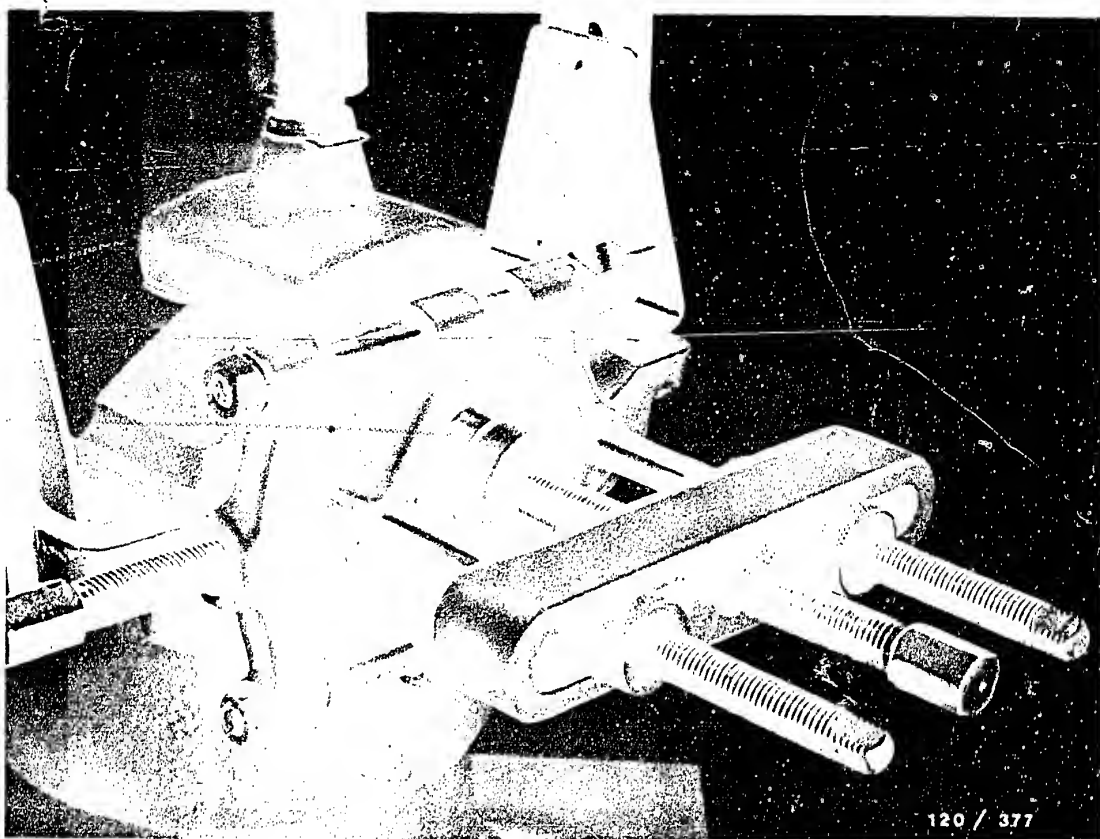
Max. deviation on collector rings 0.03 mm.

If deviation is greater, machine the collector rings.

Min. diameter of the collector rings

|                          |         |           |
|--------------------------|---------|-----------|
| Alternators 0 120 340 .. | new     | min. dia. |
|                          | 32.5 mm | 31.5 mm   |





### 11.10 Pulling the collector rings off

Remove solder from the leads of the exciter coil of the collector rings. Using a commercially available extracting tool, pull the collector rings from the rotor shaft (figure).





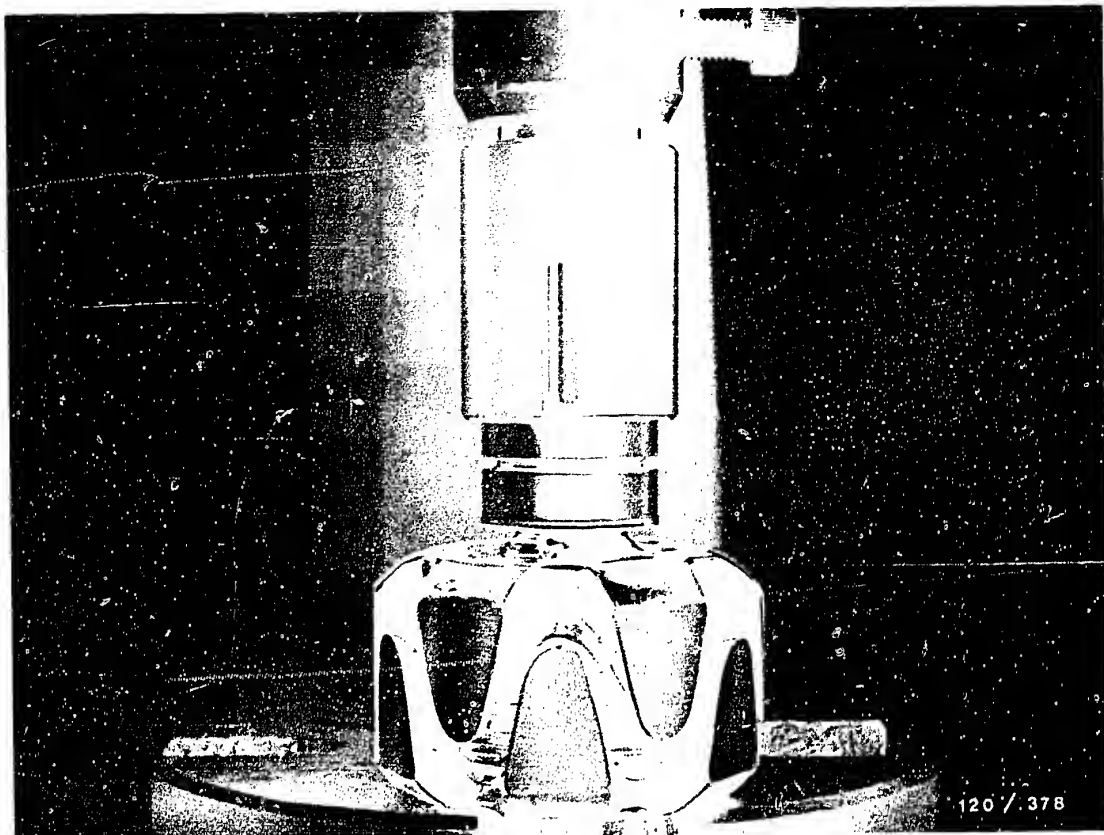
## 12. Cleaning parts

CAUTION! FIRE HAZARD!

Alternators are increasingly being fitted with capacitors with a long storage life (e.g., for interference suppression of receivers and transmitters).

When alternator parts (rectifiers) are being washed out, the capacitor can discharge when immersed in the cleaning fluids. This can cause flammable liquids to ignite. For that reason, wash out parts with capacitors only in tri- or perchlorethylene.



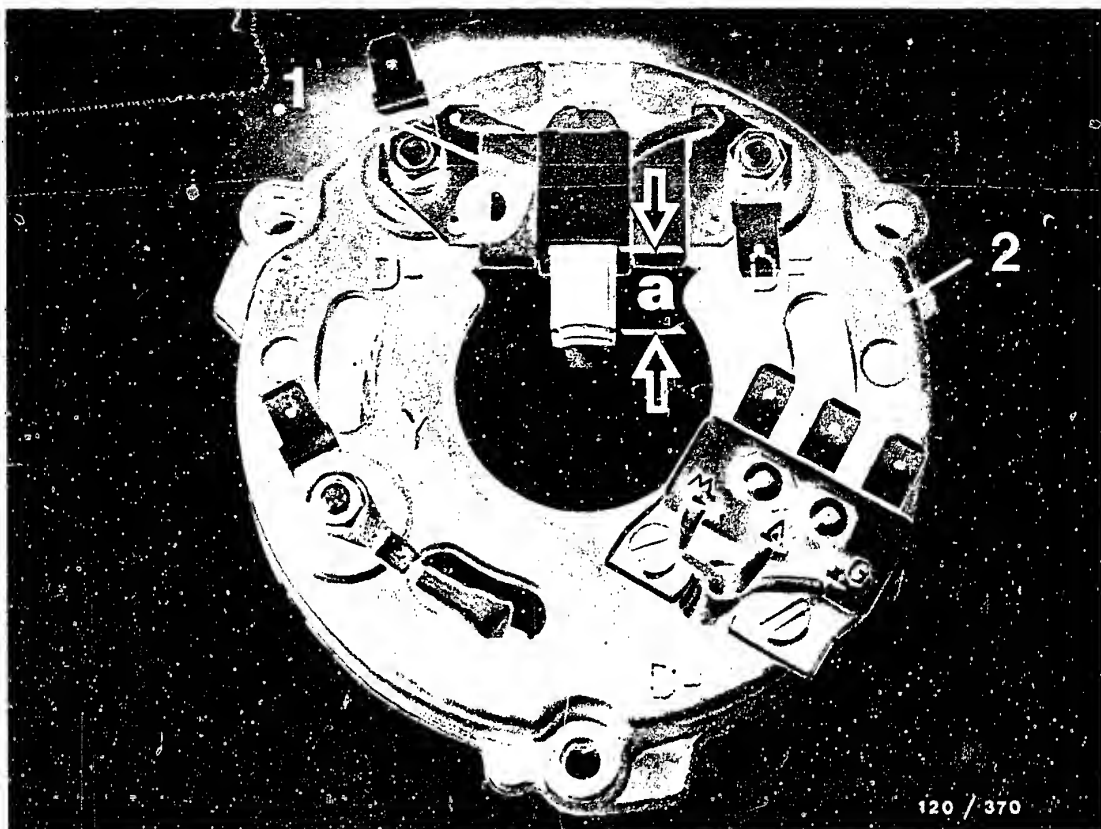


### 13. Repairing components of the alternator

#### 13.1 Pressing on the collector rings.

Place the collector rings on the rotor axis. Introduce one lead from the exciter winding into the slot of the collector rings. Then, using pressing tools KDLI 6010 and 6012 press the collector rings on far enough so that the face of the axle is even with the face of the collector ring. In so doing lay the slot of the pressing tool in such a way that the lead of the exciter coil that is being guided through the collector rings is visible. Solder the wire leads on the exciter winding. Machine the soldered location on the two collector rings far enough so that the collector rings no longer show any unevenness.





- 1 = Brush holder  
2 = Stator housing

### 13.2 Taking out and replacing carbon brushes

If the carbon brushes are broken off, or if the projection dimension "a" is less than 5 mm, take out and replace the carbon brushes.

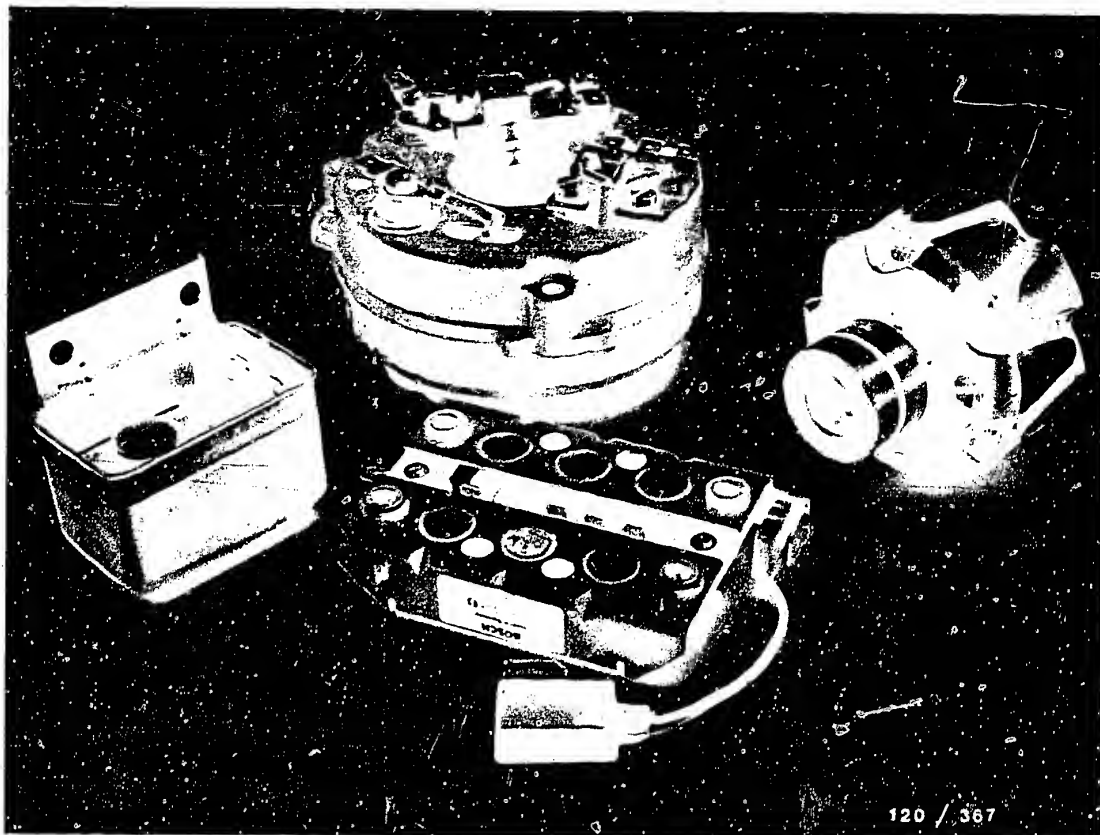
When soldering the new carbon brushes in, maintain projection dimension "a" (do not shorten the shunt).

| Alternators  | Collector rings dia (mm) |           | Projection of carbon brushes (mm) |      |
|--------------|--------------------------|-----------|-----------------------------------|------|
|              | new                      | min. dia. | new                               | min. |
| 0 120 340 .. | 32.5                     | 31.5      | 10                                | 5.0  |

Note: It is not permissible for the solder (rosin-core solder only) to flow into the copper strand.

After installation, check carbon brushes for ease of movement.





#### 14. Assembling the alternator (regulator, rectifier; stator, rotor)

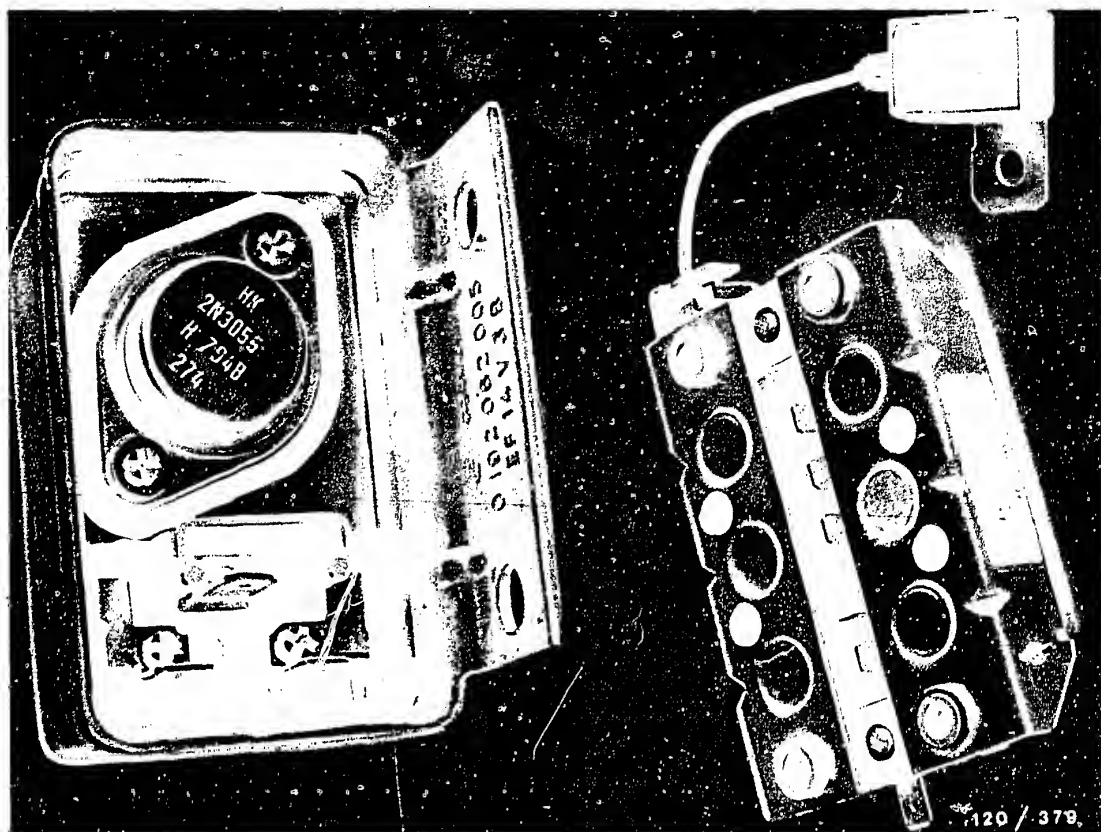
Put the rotor on the drive shaft. Screw in the fastening screw, tighten to 20 ... 24 Nm.

Pull back the carbon brushes in the carbon brush holder. Set on the stator, and fasten it to the engine housing using 3 socket hex screws.

Tightening torque 2.7 ... 3.8 Nm.

Put on connections D-, DF, Y and the triple plug.





Fasten the regulator and the rectifier with the suppression capacitor to their former location on the motorcycle.

Connect the stator electrically to the regulator and rectifier.

Tightening torque for fastening screws on:

rectifier = 2.7 ... 3.8 Nm

regulator = 4.2 ... 6.0 Nm

suppression capacitor = 2.7 ... 3.8 Nm



## 15. Checking the alternator and regulator with the engine running

### 15.1 Prerequisites for testing

Battery charged, electrolyte density min.  $1.24 \text{ g/cm}^3$ .  
A fully charged battery (electrolyte density  $1.28 \text{ g/cm}^3$ ) is required when measuring the regulated voltage, because a non-fully charged battery acts too long as an attenuator if there is a regulator short (full excitation).

Battery connected to the vehicle electrical system.  
Check the ground strap engine-frame for good connection.  
Fuel system O.K., engine mechanically O.K.

Ambient temperature  $+20 \dots +30^\circ\text{C}$ .

(The temperature has a strong effect on the measurements).

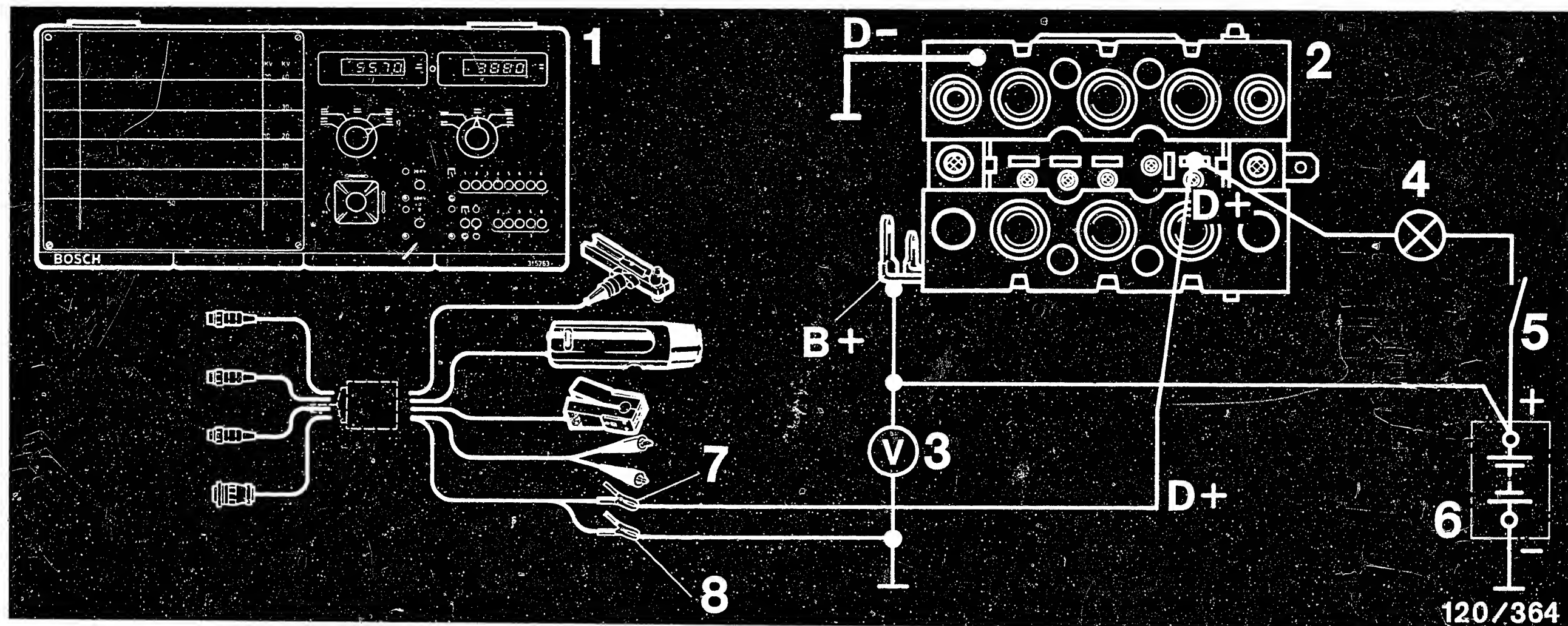
Alternator temperature min.  $+60^\circ\text{C}$ .

During the test, at least  $5 \text{ m}^3/\text{sec}$ . of air must be supplied to the alternator from an outside source (fan).

### 15.2 Test equipment

|                       |              |               |
|-----------------------|--------------|---------------|
| Volt-ampere tester    | ETT 011.00   | 0 684 101 100 |
| Electric Tester<br>or | ETE 014.00   | 0 684 101 400 |
| Bosch Motortester     | MOT 300      | 0 684 000 201 |
| Oscilloscope          | (all models) |               |





1 = Oscilloscope  
2 = Rectifier

3 = Voltmeter  
4 = Charge indicator light

5 = Ignition and starting switch  
6 = Battery  
7 = Red terminal  
8 = Black terminal

### 15.3 Checking the alternator with the oscilloscope

The oscilloscope test includes the identification of defects in the alternator by means of defect patterns (diode and phase defects).

Connect the oscilloscope to the rectifier using the test lead that goes with it (see figure above).

Connect red terminal to D+ connection, black terminal to D- connection (ground). Connect the voltmeter between B+ on the rectifier and B-.

Start the engine and operate it at a rotational speed approx.  $2000 \text{ min}^{-1}$ . Compare the oscillogram appearing on the screen with the oscillograms shown on the coordinates that follow. If the oscillograms deviate from the "good" oscillogram, take out the stator, water, regulator, and rectifier. Check individual parts (see starting from coordinates D1). If the oscillogram is "good" continue with the regulator test and the power test on coordinates E 10.

**E2**

Testing

Motorcycle alternators 0 120 340 ..



**E3**

Testing

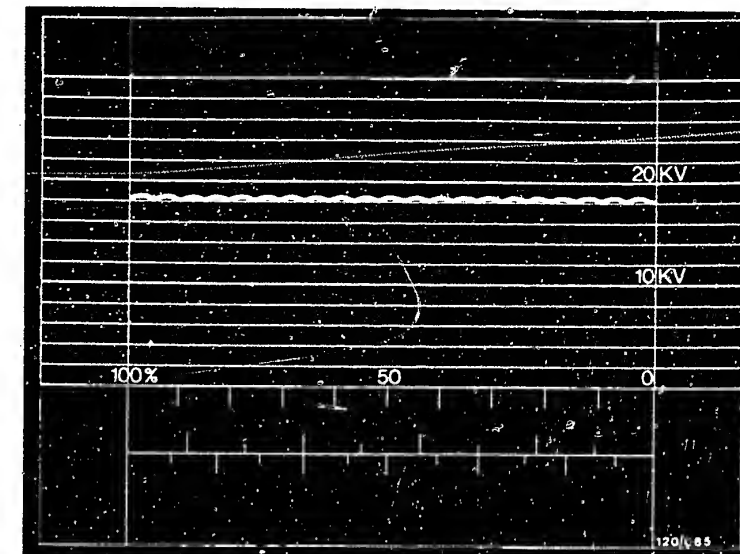
Motorcycle alternators 0 120 340 ..



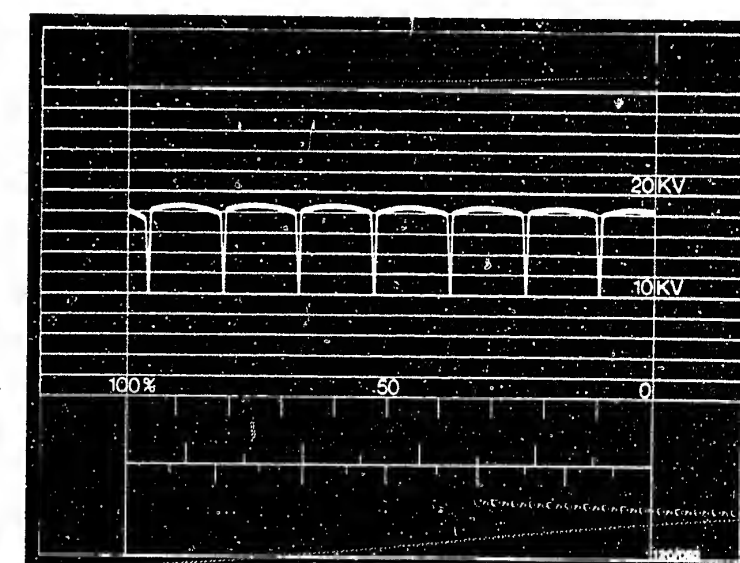
If the alternator is in proper condition, this pattern is obtained. The DC voltage has a slight ripple. The oscillogram shown can have slight peaks if the alternator regulator is working. The regulator can be "set still" by adding load (e.g., loading resistor). Adjust the height of the pattern in such a way that the ripple lies between 2 adjacent kV lines.

In order to make it possible to compare such patterns, adjust the pattern in question using the vertical controller on the oscilloscope in such a way that it fits in approximately between the 10 and 20 kV lines.

Note: Several defects can occur simultaneously.



The oscillogram shows phase defects (open circuit)



**E4**

Testing

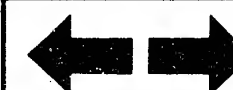
Motorcycle alternators 0 120 340 ..



**E5**

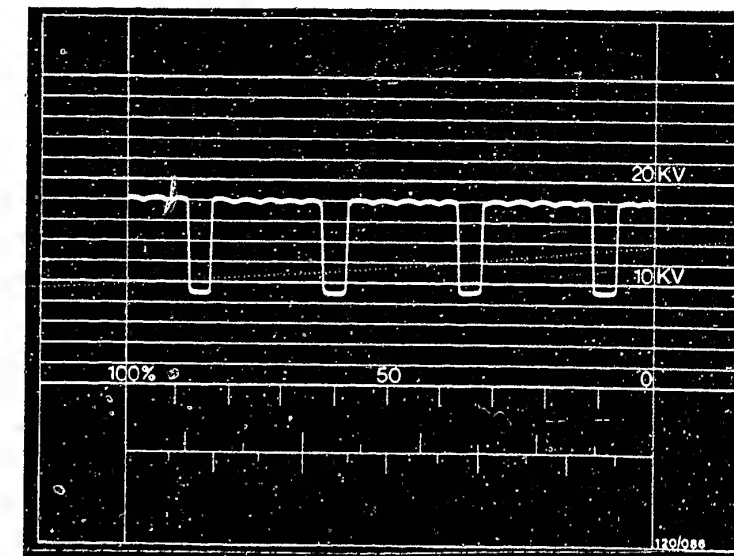
Testing

Motorcycle alternators 0 120 340 ..

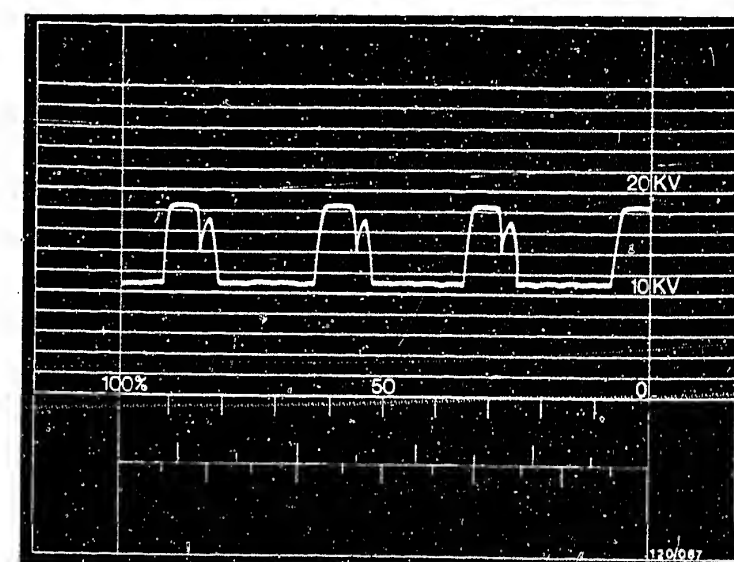




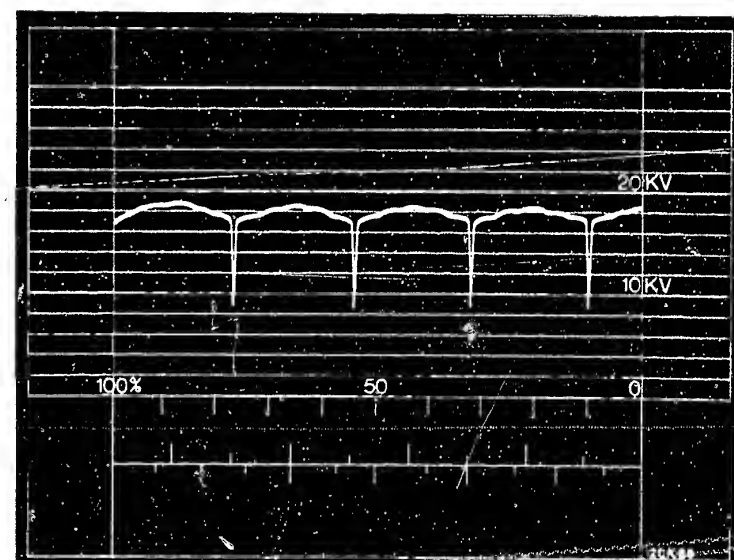
The oscillogram shows an open circuit in an exciter diode.



The oscillogram shows an open circuit in a positive diode. If several diodes are connected in parallel in an alternator, this oscillogram appears only if all the diodes have an open circuit.



The oscilloscope shows an open circuit in a negative diode. If there are several diodes connected in parallel in an alternator, this oscilloscope appears only if all the diodes have an open circuit.



**E6**

Testing

Motorcycle alternators 0 120 340 ..



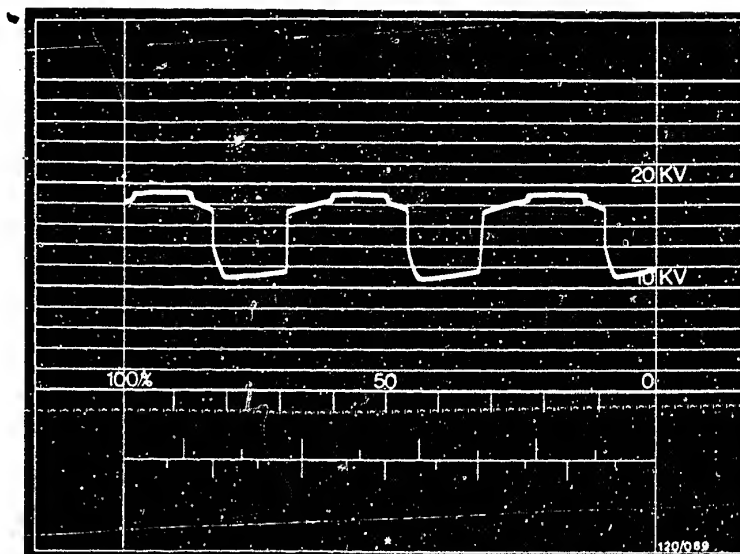
**E7**

Testing

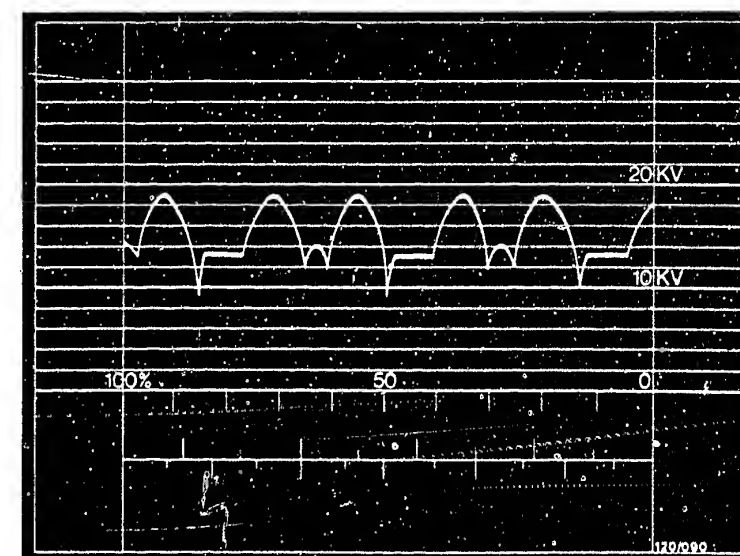
Motorcycle alternators 0 120 340 ..



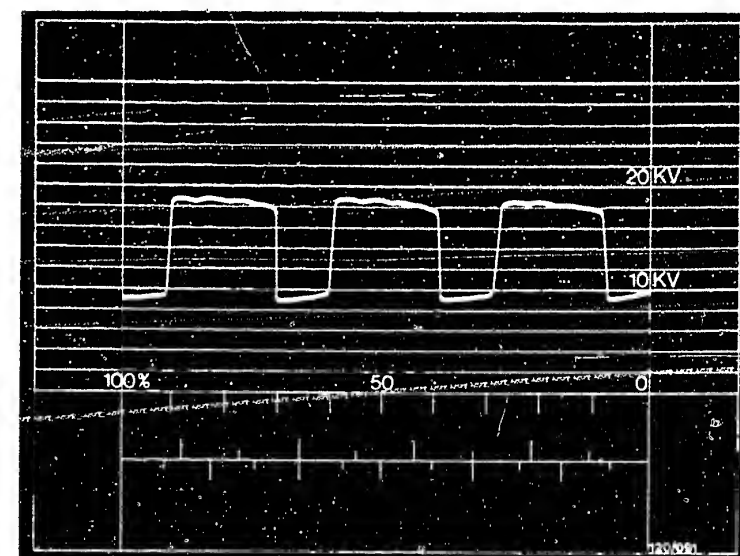
The oscillogram shows a short in an exciter diode.



The oscillogram shows a short in one or more positive diodes.



The oscillogram shows a short in one or more negative diodes.



**E8**

Testing

Motorcycle alternators 0 120 340 ..

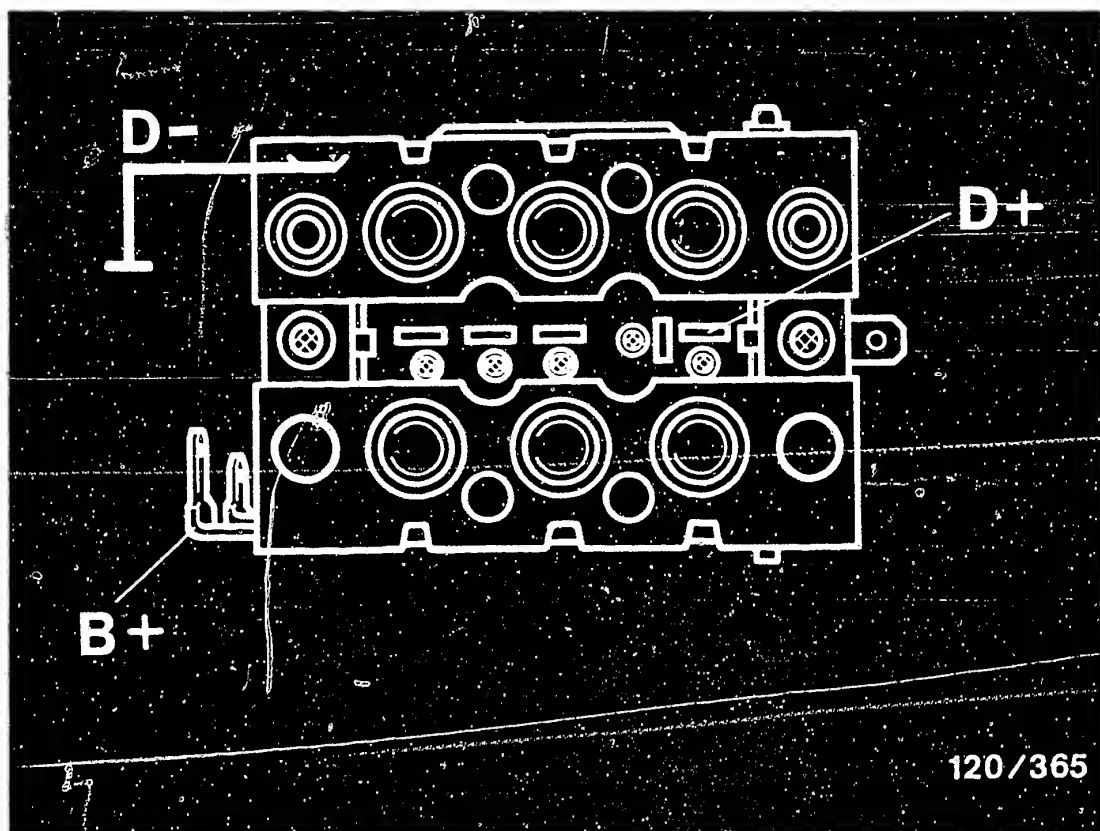


**E9**

Testing

Motorcycle alternators 0 120 340 ..





#### 15.4 Checking regulated voltage

Connect voltmeter to rectifier Term.. B+ (see figure above).

Start engine and operate it at speed of approx. 2000 min<sup>-1</sup>.

Measure regulated voltage from B+ on rectifier to D-.

Specified value: Regulator 0 192 062 002 (EF)

13.7 ... 14.5 V

at loading  $\leq 10$  A

If the regulated voltage is within the indicated tolerance, the regulator is O.K. Otherwise take out and replace the regulator.

## 15.5 Power test

(Warm alternator (+60°C) with regulator)

Connect volt-ampere tester to rectifier B+ and D- according to operating instructions.

Start engine.

Set speed according to table below.

Set load according to table below using loading resistor.

Once the speed and loading prescribed have been attained, the alternator voltage must not be greater than 13.0 V.

| Alternators       | Rotational speed<br>min <sup>-1</sup> | Load current<br>A |
|-------------------|---------------------------------------|-------------------|
| 005               |                                       |                   |
| G1 (RL) 14V 18A22 | 1350                                  | 5                 |
|                   | 2200                                  | 12                |
|                   | 5000                                  | 18                |
| 006               |                                       |                   |
| G1 (RL) 14V 20A18 | 1050                                  | 5                 |
|                   | 1800                                  | 13                |
|                   | 7000                                  | 19                |
| 002/004           |                                       |                   |
| G1 (RL) 14V 20A21 | 1300                                  | 5                 |
|                   | 2100                                  | 13                |
|                   | 7000                                  | 20                |

If the test specifications are attained, the alternator is O.K. If the test specifications are not attained, check all connecting lines and the plug connections for them between the battery, regulator, rectifier, and stator for contact resistance or breaks. Eliminate contact resistance or breaks.



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

### Parts Cleaning

Use of highly-inflammable cleaning agents, or cleaning agents which are dangerous to health

**Gen.**

VDT-I-Gen./18 En  
7, 1978

When cleaning parts which come from vehicle electrical products prior to repair, it is permitted to use the following cleaning agents: Benzine, trichloroethylene (tri) and perchloroethylene (per). These are dangerous, and must be handled with appropriate care. The relevant safety regulations in West Germany are:

Regulations concerning work with inflammable liquids  
(VbF) issued by the Federal Labor Ministry (BmA).

Safety regulations for the use of chlorinated hydrocarbons  
as applied to the works ZH1/222  
as applied to personnel ZH1/119

as issued by the Federation of the Trade co-operative Associations  
(Central Association for Accident Prevention and Industrial Medicine)  
Langartweg 103, D-5300 Bonn 5).

1. Benzine, acetone and ethanal (ethyl alcohol) are inflammable liquids and their mixtures with air are dangerous due to the risk of explosion. Parts washing may only take place in tanks or containers safely intended for this purpose and equipped with a "melt" safety device for the lid which, in case the liquid catches fire, causes the lid to close automatically and smother the fire. In the case of larger containers (exceeding 500 x 500mm) some form of suction extraction must be provided.
- 1.1 Generators, alternators, wiper motors, small-power motors and other electrical equipment for installation in vehicles are, in ever increasing numbers, being equipped with capacitors having long storage times (e.g. for interference-suppression purposes in radio-receiver or transmitter installations).

When washing such parts, it is possible that a capacitor discharge can occur when the part is immersed in the cleaning agent. This can lead to an inflammable liquid catching fire. For this reason, parts on which a capacitor is fitted are only to be washed in trichloroethylene (tri) or perchloroethylene (per).

- 1.2 In the case of starting motors, it has already been pointed out in earlier repair instructions that the parts should be thoroughly dried after washing in benzine, this applies particularly to windings. With sliding-gear starting motors, the first test run after washing out must be performed without the closure cap in order to avoid the possibility of explosion.

**BOSCH**

Gesellschaft Reich-KH Kundendienst: Kfz-Ausrüstung  
by Robert Bosch GmbH, D-7 Stuttgart 1 Postfach 50. Printed in the Federal Republic of Germany  
Imprimeur: République Fédérale d'Allemagne par Robert Bosch GmbH

**N1**

Technical Bulletin

Motorcycle alternators 0 120 340 ..



2. Trichlorethylene (tri) and perchloroethylene (per) are both liquids whose vapors have a stupefying effect, and which are dangerous to health if inhaled over long periods. Tri vapor is heavier than air, and therefore especially dangerous at floor level. Gloves and goggles are to be worn when washing out parts in these liquids.

If cleaning of parts is carried out regularly, or continuously, in trichlorethylene only containers or tanks intended solely for this purpose are to be used, and the suction extraction device is to be switched on. When washing parts do not bend over the container.



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

ALTERNATORS 0 120 ..

12

VDT-I-120/107 En

9.1979

Alternator operation without battery

### General

Unless special measures are taken, alternators are not to be operated without the battery connected because otherwise this can lead to the destruction of semiconductor components in the regulator, alternator or vehicle electrical system.

In the case of special-purpose vehicles, auxiliary or stationary equipment, or vehicle export, it can be necessary for the alternator to operate without battery - with or without power output.

With systems where the regulator is mounted separately from the alternator, the alternator is placed out of operation before starting by open-circuiting the line between it and the regulator. Power output is now impossible.

This method cannot be used with systems having an attached-type regulator. In such cases, the following methods are used. Details can be taken from the product specifications.

#### 1. Systems with increased voltage-proof characteristics

A variety of vehicle manufacturers order such systems because during shipping it can occur that operation takes place without battery. In such exigencies, power output is possible depending upon alternator speed. These measures protect the alternator and regulator but not the loads.

#### 2. Zener diode 1 127 328 .. for 14 V alternators and max. 35 A

This Zener diode is connected to Terminal B+ of the alternator. If the voltage rises above the response voltage of the Zener diode this conducts and the voltage peak is conducted away through the diode heat sink to the alternator housing. In this way semicon-

**BOSCH**

Geschäftsbereich Kfz-Kundendienst, Kfz-Ausrüstung  
by Robert Bosch GmbH, D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany  
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

**N3**

Technical Bulletin

Motorcycle alternators 0 120 340 ..



ductors in the alternator and regulator are protected against voltage peaks and if necessary the system can deliver power. If required, this Zener diode can be fitted as series equipment on new alternators or can be retro-fitted. Connection in parallel or series of these Zener diodes for the purpose of increasing the power is not possible.

Notes on testing are contained in Instructions VDT-W-120/300.

Burnt-out connections between Zener diode and alternator B+ are the result of false polarity during battery change, use of auxiliary starting aids or operation with 24 V etc.

Warranty claims are therefore to be rejected.

### 3. Systems with over-voltage protection devices fitted

For years, such devices (ÜSG) have been available either integrated in the regulator e.g. 0 192 083 .. or separate 0 192 900 .. for use in 28 V systems.

When voltages occur in excess of the ÜSG response voltage, the Terminals D+ and D- are connected together by the ÜSG. The alternator is short-circuited and cannot self-excite. This means that resultant damage in the vehicle electrical system due to excessive alternator voltage is avoided.

As long as the ÜSG does not conduct, without battery connected, the alternator can deliver power.

### 4. Short-circuit capsule 1 120 505 000 for K1, N1 and T1 alternators

In order that the alternator does not self-excite during operation without battery, Terminals D+ and D- are connected together. At customer request, certain alternator models are equipped at the works with a short-circuit capsule connected to Terminal D+ for this reason. This enables engines and vehicles to be tested on dynamometers etc. without the battery being connected. Power cannot be taken from the alternator.

After the battery is connected the capsule is removed so that the system is ready for operation. If, subsequently, operation without battery is required, D+ and D- must be connected together again.

Details regarding the Part Numbers of the products dealt with in this Bulletin can be requested from your local Bosch representative.





## Table of contents

| <u>Section</u>   | <u>Coordinates</u> |
|--|--------------------|
| Structure of the microfiche  | A 1                |
| 1. Special features  | A 2                |
| 2. Test specifications   | A 2                |
| 2.1 Electrical test specifications   | A 2                |
| 2.2 Mechanical test specifications   | A 5                |
| 3. Wiring diagram for alternators  | A 7                |
| 4. General instructions  | A 8                |
| 5. Test equipment and tools  | A 11               |
| 6. Exploded diagram  | A 13               |
| 7. Installation position and instructions for removal  | A 15               |
| 8. Trouble-shooting  | B 1                |
| 9. Frequent types of defects   | B 19               |
| 9.1 Charge indicator light does not turn on with ignition turned on and engine at standstill | B 19               |



## Table of contents (continued)

### Coordinates

|     |  |      |
|-----|--|------|
| 9.2 | Charge indicator light turns on<br>with ignition shut off                | B 21 |
| 9.3 | Charge indicator light does not go<br>out with engine running            | B 23 |
| 9.4 | Weak battery charging (starting<br>difficulties)                         | C 1  |
| 9.5 | Overcharging of the battery<br>(development of gas)                      | C 3  |
| 10. | Disassembling the alternator<br>(regulator, rectifier, stator,<br>rotor) | D 1  |
| 11. | Checking components of the alternator                                    | D 3  |
| 12. | Cleaning parts   | D 13 |
| 13. | Repairing components of the<br>alternator                                | D 14 |
| 14. | Assembling the alternator<br>(regulator, rectifier, stator,<br>rotor)    | D 16 |
| 15. | Testing the alternator and the<br>regulator with the engine running      | E 1  |
|     | Technical Bulletin<br>Cleaning of parts                                  | N 1  |
|     | Technical Bulletin<br>Alternator operation without battery               | N 3  |



© 1984 Robert Bosch GmbH

Automotive Equipment - After-Sales Service  
Department for Technical Publications KH/VDT,  
Postfach 50,  
D-7000 Stuttgart 1

Published by: After-Sales Service  
Department for Training and Technology  
(KH/VSK).

Publication date 7.1984.

Please direct questions and comments concerning the contents to our authorized representative in your country.

This publication is only for the use of the Bosch After-Sales Service Organization, and may not be passed on to third parties without our consent.

Microfilmed in the Federal Republic of Germany.  
Microphotographié en République Fédérale d'Allemagne.

